MONITOR HEATING SYSTEMS
Service Manual

MONITOR 22

MONITOR 41

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MONITOR HEATING SYSTEMS
Table of Contents

Section 1: Description ..... Page 1~7

1-1 Introduction; 1-2 Physical Specifications; 1-3 Functional Description; 1-4 Description; 1-5 Spill Tray; 1-6 Heater Cabinet; 1-7 Combustion System; 1-8 Combustion Ghamber; 1-9 Burner Pot; 1-10 Combustion Ring Assembly; 1-11 Burner Cap; 1-12 Flame Sensor; 1-13 Igniter; 1-14 Combustion Air System; 1-15 Flue Pipe; 1-16 Combustion Blower; 1-17 Heat Exchanger; 1-18 Air Circulation Fan; 1-19 Air Pressure Switch; 1-20 Fuel Delivery System; 1-21 External Fuel Tank; 1-22 Fusible Link Valve; 1-23 Fuel Constant Level Valve; 1-24 Solenoid Pump; 1-25 Electrical System; 1-26 Microprocessor; 1-27 Temperature Sensor; 1-28 Safety Mechanism; 1-29 Cloth Covered Exhaust Pipe; 1-30 Air Circulation Fan Guard; 1-31 Fuse; 1-32 Overheat Protector Switches : 1-33 Slide Selector For the Reset Temp.

Section 2: Installation ..... Page 9~21

2-1 Introduction; 2-2 Physical Placement of Heater; 2-3 Drilling Requirements; 2-4 Power Requirements; 2-5 Fuel Tank Requirements; 2-6 Temperature Sensor Wiring Requirements; 2-7 Building Codes; 2-8 Un-packing; 2-9 Heater Installation; 2-10 Installing an Extension Kit; 2-11 Typical Monitor Lifter Pump Installations; 2-12 Uses for the Elbow Adapter Kit; 2-13 Fuel Tank Installation; 2-14 Heater Installation

Section 3: Operation ..... Page 22~33

3-1 Introduction; 3-2 Operating Specifications; 3-3 Operating Controls and Indicators; 3-4 Pre-operation Check List; 3-5 Operation; 3-6 Manual Heater Operation; 3-7 Automatic Heater Operation; 3-8 Reprogramming the Monitor Heater; 3-9 Heat Sensor; 3-10 Monitor Shutdown; 3-11 Out of Fuel; 3-12 Recovery from a Power Failure; 3-13 Recovery from Overheat Condition; 3-14 Recovery from Blown Fuse 3-15 Operation Control system

Section 4: Maintenance ..... Page 34~37

4-1 Introduction; 4-2 Periodic Maintenance; 4-3 Inspect Exhaust Air Lines; 4-4 Verify Igniter Operation; 4-5 Clean Fuel Constant Level Valve Filter; 4-6 Cleaning Fusible Link Valve Intake Fitting on M-22; 4-7 Corrective Maintenance; 4-8 Replacement of Fuses; 4-9 Fuel Contamination

MONITOR HEATING SYSTEMS
Table of Contents

Section 5: Servicing ..... Page **38~40**

5-1 Introduction; 5-2 Measurerment of Fuel Flow rate; 5-3 Removal of Water Deposits and Contaminants from Fuel Constant Level Valve and Fuel Lines; 5-4 Cleaning the Burn Chamber & Burner Pot; 5-5 Cleaning the Fuel Inlet

Section 6: Troubleshooting ..... Page **41~54**

Resistance Values
component Voltage Readings
Test Point Voltage
Troubleshooting Diagrams (Mechanical)
Troubleshooting Diagrams (Electrical)
Indication of Failure mode

Section 7: Electrical System ..... Page **55~57**

Schematic
Monitor 41 Printed Circuit Board Wiring Diagram
Monitor 22 Printed Circuit Board Wiring Diagram

MONITOR HEATING SYSTEMS
Table of Contents

Section 1: Description ..... Page 1~7

1-1 Introduction; 1-2 Physical Specifications; 1-3 Functional Description; 1-4 Description; 1-5 Spill Tray; 1-6 Heater Cabinet; 1-7 Combustion System; 1-8 Combustion Chamber; 1-9 Burner Pot; 1-10 Combustion Ring Assembly; 1-11 Burner Cap; 1-12 Flame Sensor; 1-13 Igniter; 1-14 Combustion Air System; 1-15 Flue Pipe; 1-16 Combustion Blower; 1-17 Heat Exchanger; 1-18 Air Circulation Fan; 1-19 Air Pressure Switch; 1-20 Fuel Delivery System; 1-21 External Fuel Tank; 1-22 Fusible Link Valve; 1-23 Fuel Constant Level Valve; 1-24 Solenoid Pump; 1-25 Electrical System; 1-26 Microprocessor; 1-27 Temperature Sensor; 1-28 Safety Mechanism; 1-29 Cloth Covered Exhaust Pipe; 1-30 Air Circulation Fan Guard; 1-31 Fuse; 1-32 Overheat Protector Switches : 1-33 Slide Selector For the Reset Temp.

Section 2: Installation ..... Page 9~21

2-1 Introduction; 2-2 Physical Placement of Heater; 2-3 Drilling Requirements; 2-4 Power Requirements; 2-5 Fuel Tank Requirements; 2-6 Temperature Sensor Wiring Requirements; 2-7 Building Codes; 2-8 Un-packing; 2-9 Heater Installation; 2-10 Installing an Extension Kit; 2-11 Typical Monitor Lifter Pump Installations; 2-12 Uses for the Elbow Adapter Kit; 2-13 Fuel Tank Installation; 2-14 Heater Installation

Section 3: Operation ..... Page 22~33

3-1 Introduction; 3-2 Operating Specifications; 3-3 Operating Controls and Indicators; 3-4 Pre-operation Check List; 3-5 Operation; 3-6 Manual Heater Operation; 3-7 Automatic Heater Operation; 3-8 Reprogramming the Monitor Heater; 3-9 Heat Sensor; 3-10 Monitor Shutdown; 3-11 Out of Fuel; 3-12 Recovery from a Power Failure; 3-13 Recovery from Overheat Condition; 3-14 Recovery from Blown Fuse 3-15 Operation Control system

Section 4: Maintenance ..... Page 34~37

4-1 Introduction; 4-2 Periodic Maintenance; 4-3 Inspect Exhaust Air Lines; 4-4 Verify Igniter Operation; 4-5 Clean Fuel Constant Level Valve Filter; 4-6 Cleaning Fusible Link Valve Intake Fitting on M-22; 4-7 Corrective Maintenance; 4-8 Replacement of Fuses; 4-9 Fuel Contamination

1-1 INTRODUCTION

The Monitor Heating System represents "state of the art" technology and, although the heater is sophisticated, it is simple to operate, takes little time to maintain and requires minimum servicing.

The Monitor is a totally integrated heater consisting of a housing(cabinet),a combustion system, an air circulation system, a fuel delivery system and micro-computer system.

Redundant safety devices are included in the heater's design to protect the user from injury and the heater from damage.

This section describes the heaters and their components.
Since a number of components have multiple functions, a component may be described more than once.

1-2 PHYSICAL SPECIFICATIONS

Listed below, are the physical specifications that apply to the Monitors:

Monitor 41:
- Height:26.6" (67.5cm)
- Width:28.7" (73cm)
- Depth:13.8" (35cm)
- Weight:82 lbs (37kg)
- Flue Pipe Hole:2 ½"(65mm)diameter

Monitor 22:
- Height:25.6" (65cm)
- Width:20.9" (53cm
- Depth:12.4" (31.5cm)
- Weight:55 lbs (25kg)Empty
- Flue Pipe Hole:2 ½(65mm)diameter

1-3 FUNCTIONAL DESCRIPTION

An overview of the functional operation of the Monitors is diagrammed by Figure 1-1 and is described as follows:

Monitor operation always begins with a pre-purge and a pre-heat, which must be completed before operation can begin to expel kerosene vapors from the Combustion Chamber.

At conclusion of the pre-heat, the Fuel Pump begins to work, the fuel is delivered into the pre-heated burner, and then an air fuel mixture is ignited, combustion takes place, and the heater keeps pre-burning. When the pre-buring is finished, the igniter turns off, the circulation fan turns on (at the appropriate speed) and the heater will automatically maintain the necessary burn rate.

The user is able to monitor the heater's performance by visually examining a series of indicators on the Control Panel.

A Temperature Selector Control permits the user to set the temperature to the level desired in the room.

Upon commencing heater shutdown, a post-purge is run.
All heating operations cease-except for the air circulation fan and the combustion fan which continue. The post-purge continues for three minutes after a flame goes out.At this point, heater operation stops completely.

Auromatic operation of the Monitor 41 and Monitor 22 is controlled by a microprocessor with four sets of Time Temperature programming per day.

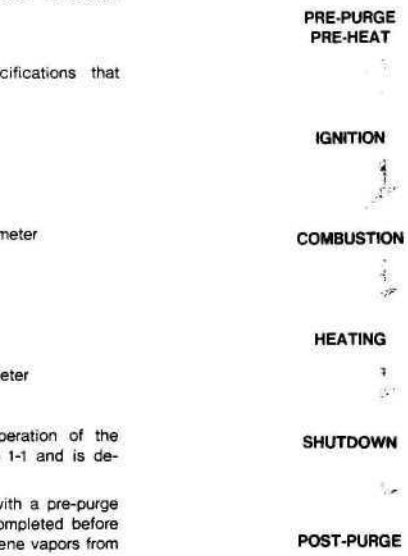


Figure 1-1
SIMPLIFIED OPERATIVE CYCLE

1-4 DESCRIPTION

The Monitor heaters are composed of the following: a spill tray, a cabinet, a combustion system, an air circulation system, a fuel delivery system, electrical and electronics systems and a variery of safety

mechanisms.

1-5 SPILL TRAY

The Spill Tray:

- Protects the floor from damage resulting from fuel spillage.
- Provides a secure, tip-resistant heater base.

Metal retainers (2) secure the heater to the Spill Tray.

The legs are positioned with in the circular indentations.

1-6 HEATER CABINET

A steel Cabinet holds and protects all internal components.

A number of primary parts are assembled to form this housing.

1-7 COMBUSTION SYSTEM

The Combustion System is responsible for the production of heat which is circulated into the room.

In the Combustion Systems a mixture of fuel and air is burned to produce heat. Air is drawn from outside the dwelling into the Combustion Chamber. At the same time, fuel is metered from a storage cavity into this same Combustion Chamber.Within the chamber,the air fuel mixture is ignited to produce heat. The Monitor combustion systems are safeguarded by a pair of overheat protector switches; They will shut down the heater (to protect it from damage) in the event of excessive heat build-up. The overheat protector switches reset automatically after cooling down.

1-8 COMBUSTION CHAMBER

This tall cylinder is positioned on the Heater Base. It is secured to the base by phillips head screws.

Connected to the Combustion Chamber are the igniter, (located within the chamber) a fuel line, the Heat Exchanger, and a Flame Sensor.

Within the Combustion Chamber are the Burner Pot, the Combustion Ring Assembly and the Burner Cap(M-22). Access to those internally-located parts is facilitated by a removable Service panel.A Window on the panel lets the technician visually examine the combustion process(i.e. glowing igniter or proper flame color).

An airway, in the Cabinet Base, extends from the intake fan of the Combustion Blower to the hollow base of the Combustion Chamber. This airway channels air to the Combustion Chamber.

The Flame Sensor is mounted with two (2) phillips head screws onto the wall of the Combustion Chamber.

1-9 BURNER POT

Designed specifically to support combustion, the Burner Pot (refer to Figure 1-2) contains a series of air holes, an igniter tube (to accommodate the Igniter), and a fuel inlet fitting (interconnects the fuel line). It is secured to a mounting plate near the bottom of the Combustion Chamber.

The Combustion Ring Assembly is seated on three (3) screws or pins in the Burner Pot.

1-10 COMBUSTION RING ASSEMBLY

This assembly is a special structure, designed to promote efficient combustion.

1-11 BURNER CAP

Secured by tabs and a screw on the Burner Pot, the Burner Cap "shapes" the flame into its comfiguration and height. (M-22 only)

1-12 FLAME SENSOR

Mounted on the outside wall of Combustion Chamber, the Flame Sensor always supervises the flame.

1-13 IGNITER

Located within the igniter tube of the Burner Pot, the Igniter is designed to pre-heat the Burner Pot and to vaporize and ignite the air/fuel mixture to start the combustion process.

The Igniter is secured by a bracket and screw to the igniter tube. The cover plate is secured to the combustion chamber by three (3) phillips head screws.

1-14 COMBUSTION AIR SYSTEM

The Combustion Air System channels air to and from the heater.

Outside air is drawn into the heater by the Combustion Blower through an airway to the Combustion Chamber.

A Combustion Blower draws the intake air into the through a Flue Pipe. This air enters the Combustion Chamber at the Burner Pot and mixes with the fuel to support combustion, Remaining air is heated and is drawn into the Heat Exchanger.

As the heated air passes through the Heat Exchanger, an Air Circulation Fan blows room air past the Heat Exchanger and out again into the room, heating passing air by convection. Exhaust vapors exiting from the Hear Exchanger are vented through the Flue Pipe.

A deterioration of air pressure at the Air Pressure Switch is an abnormal condition; the heater is shut down by the malfunction.

1-15 FLUE PIPE

Flue Pipes are available in three (3) sizes. This provides the flexibility to meet the installation requirements for dwelling of various wall thicknesses.

One side of the Flue Pipe contains a "T"-shaped fitting consisting of four ports. This side is mounted on the interior wall of the dwelling. The pipe side of the Flue Pipe is vented outside the dwelling.

The Flue Pipe Assembly consists of two concentric tubes. Outside air is drawn through the cylindrical space between the tubes.
Combustion by-products are vented through the inner tube.

As the cool air enters, it is heated by the hot air that is exiting the system.

A large-bore, flexible hose connects the air inlet port on the Flue Pipe with the Combustion Blower; a cloth-covered metal pipe connects the Combustion Blower with the exhaust outlet on the Flue Pipe.

IMPORTANT: If extension kits are utilized, use the correct damper as follows:

Extension kit	M-41	M-22
Up to 3 elbows with Extra Short Extension kit Length: 11¼"-7¼"	"STANDARD" damper	"STANDARD" damper
Up to 3 elbows with Short Extension Kit Length: 11¼"-20¼"	"STANDARD" damper	"STANDARD" damper
Up to 3 elbows with Medium Extension Kit Length: 20¼"-38"	"EXTENSION" damper	unused
Up to 3 elbows with Long Extension Kit Length: 38"-73"	"EXTENSION" damper	unused

1-16 COMBUSTION BLOWER

The combustion blower on the Monitor 22 is a dual function fan.
The intake fan draws in outside air thru the flue pipe for internal combustion. The cooling fan which runs on a common shaft with the intake fan circulates air inside the heater cabinet to keep internal components cool.

The Monitor 41 combustion blower has a two stage intake fan.

Burner modes control fan speeds and the solenoid damper in the blower casing. Those functions are as follows:

Table 1-1 COMBUSTION AIR CONTROL

Burn Mode	Fan Speed	Solenoid Damper
High	High	On (Open)
Medium-High	Low	Off (Open)
Medium-Low	Low	On (Close)
Low	Low	On (Close)

1-17 HEAT EXCHANGER

An inlet at the top of the Heat Exchanger permits the heated air to travel from the Combustion Chamber into the exchanger.
An outlet, at the bottom of the exchanger, permits combustion by-products to be vented to the Flue Pipe.

While moving through the Heat Exchanger, the hot air within the exchanger heats the outside metal walls. The hot metal walls, in turn, heat air that is pushed past the exchanger and is circulated into the room. An air baffle, directly in front of the exchanger, deflects the heated air upwards, and out, through the louver assembly.

A pair of Over-Heat Protector Switches protect the heater from damage due to excessive heat built-up.

1-18 AIR CIRCULATION FAN

Both Monitor circulation fans are driven by two-speed motors and are designed to circulate the heated room air.

If the heater is running in low and medium-low burn modes, the fan also runs at low-speed; in medium-high or high burn modes, the fan advances to high-speed.

Operation of the fan is controlled by the microprocessor and fan thermostat switch (52°C 126°F···on, 35°C 95°F···Off)

Physically assembled with a protective wire cage for the Monitor 41 and metal mesh cage for Monitor 22, the entire fan assembly is secured to a bracket on the rear of the Heater Cabinet.

A metal conduit, at the rear of the heater, protects the fan wiring from damage.

1-19 AIR PRESSURE SWITCH

This switch consists of a rubber diaphragm which senses changes in air pressure(it is connected to the Combustion Blower) and normally-open, micro switch.

Should an abnormal pressure differential exist, the switch opens to disable the circuitry that controls

the supply of fuel. Since the flow of fuel to the Burner Pot is cut off,the flame extinguishes (after all fuel currently in the line has been consumed), and the Burner Status Indicators blink.

This safety mechanism can be triggered by several conditions:

- Leak or loose connection in air line
- Leak, loose, or broken tubing which connects the Air Pressure Switch with the Combustion Blower
- Clogged or blocked Air Line
- Blocked or clogged Flue Pipe
- Intake port of Combustion Blower is blocked.
- Combustion Blower is inoperable

1-20 FUEL DELIVERY SYSTEM

Fuel Delivery is a very important aspect of the Monitor's operation.

The fuel flow must be maintained at a level corresponding to the burn mode, so that combustion can be conducted efficiently.

Fuel moves by gravity-flow from the external fuel storage tank or the capsule fuel tank to the Fuel Constant Level Valve.

The Solenoid Pump meters the flow of fuel from the Fuel Constant Level Valve to the Burner Pot.

The metered flow of fuel is carried to the Burner Pot by a copper fuel line.

1-21 EXTERNAL FUEL TANK

The Monitor 22 gives the user the option of either using the internal capsule tank or hooking up to an external fuel tank.

Fuel for the Monitors can be stored in, and fed from an external storage tank. The tank, which generally is dealer installed, should contain a shutoff valve, a fuel filter and a vent. Installation of the tank should conform to local regulations and to the specifications and guidelines documented in this Service Manual.

1-22 FUSIBLE LINK VALVE

Basically, the Fusible Link Valve is a safety mechanism that cuts-off fuel to the heater in the event of an overheat condition at the valve.

The fusible link valve is mounted as a standard item on the Monitor 22. Located outside the rear of the Heater Cabinet, the Fusible Link Valve is a spring-loaded device that cuts off the supply of fuel to the heater when the temperature level (at the valve) exceeds a predefined maximum limit.

An inlet on the bottom of the valve allows fuel to pass into the heater. The handle-which can also manually be opened or closed-sits on a spring-loaded stem which contains a low-melting point alloy.

The fusible link valve can be externally mounted on the Monitor 41 if required.

1-23 FUEL CONSTANT LEVEL VALVE

This valve has an automatic shutoff safety mechanism and a Fuel Set Lever. The safety mechanism *prevents fuel from flooding or overflowing from the* fuel reservoir. The Fuel Set Lever resets the float so the Fuel Constant Level Valve can resume operation.

The fuel reservoir is a tank which contains a float assembly, a safety mechanism, and a priming lever.

Both the Monitor 22 and 41 fuel control valves are basically the same, however they are of different size and material and can not be interchanged.
Fuel enters the Fuel Constant Level Valve through an inlet at the bottom of the reservoir. As the level of fuel rises, it passes through a filter (which removes most particles and foreign matter from the fuel), flows up through an open inlet valve and enters the tank.

IMPORTANT: The Fuel Constant Level Valve filter should be cleaned or replaced periodically. Time intervals will depend on purity and quality of fuel.

Within the Valve, a float mechanism controls the level of fuel that will be permitted to the reservoir. As the fuel level drops, the float drops down to increase the inlet valve opening to admit more fuel into the valve. When the fuel level reaches its muximum volume. the float rises to shut the inlet valve.
In the event that fuel within the reservoir rises to an *abnormally high level, a float within the reservoir* rises to trip a safety lever. This safety lever drops to prevent fuel from entering into the reservoir.

Should a foreign substance cause the inlet valve to stick (or prevent it from opening), the Fuel Set Lever is utilized to free the valve and to admit fuel to the reservoir.

CAUTION: Care must be taken to prevent dust, dirt, or other debris from clogging or blocking the inlet valve. If debris collects on the seat of the inlet valve it may *cause tripping of the safety lever* and will require cleaning.

1-24 SOLENOID PUMP

The Solenoid Pump is mounted on the Fuel Constant Level Valve, controlled by a microcessor,and four modes(High,Medium-High,Medium-Low,Low) fuel flow is delivered to the Burner Pot.

1-25 ELECTRICAL SYSTEM

Electrical power is supplied to the Monitor to run the Microprocessor and the other electrically-energized component.

Electrical operation of the Monitor can be thought of as having the following eight(8) distinct phases:plug in; turn-on; pre-purge pre-heat; ignition; pre-combustion; heating; Shutdown and post-purge.

All electronic diagrams, Such as wiring diagram, circuit board layout, and electrical schematic can be found in Section 7 of this Service Manual.

1-26 MICROPROCESSOR

Principally consisting of a 64-pin Integrated Circuit, the Microprocessor provides safety timings, controls relays and provides clock and thermostat functions for the Monitor heater. A component layout of the Printed Circuit Board is found in Section 7 of this Service Manual.

1-27 TEMPERATURE SENSOR

The sensor which is capable of sensing room temperature within a range of 42°F to 96°F. can be left mounted on the back of the heater cabinet or be wall mounted.

Approximately 6' 7" (about 200 cm) of No. 20 AWG Wire is supplied with the sensor to facilitate wall mounting the sensor in a favorable location.

1-28 SAFETY MECHANISMS

Several safety mechanisms have been built into the Monitor Heating System. These devices protect the user against personal injury, protect the heater against damage, and shutdown the heater if a malfunction occurs.

1-29 CLOTH COVERED EXHAUST PIPE

Insulating cloth covers are to be placed over all metal surfaces of the Exhaust Line during installation.

Since combustion by-products are vented at elevated temperatures, the Exhaust Pipe will become hot during operation. The insulating cloth covers protect the user from burn hazards associated with accidental contact with these heated metal surfaces.

During installation make sure that all Exhaust Lines are tight. Do not operate the heater without the insulating covers.

1-30 AIR CIRCULATION FAN GUARD

This guard is an integral part of the fan assembly.

The guard protects the user against physical injury which could occur from accidental contact with revolving metal fan blade.

1-31 FUSE

2-amp. and 10-amp., 125VAC, fuses protect the heater from damage resulting from power overloads.

In the event of a power surge or internal wiring hazards, the fuse opens and power to the heater is cut off.

The electrical outlet into which the heater is connected should be protected by at least a 15-amp. fuse or circuit breaker.

1-32 OVERHEAT PROTECTOR SWITCHES

Connected in series, two (2) normally-closed Overheat Protector Switches safeguard the heaters against damage due to overheating.

The Monitor 22 switches are rated 110°C (230°F). The Monitor 41 switches are rated 115°C (239°F). Should a Monitor overheat (internal temperatures rise beyond 110°C (230°F) on the Monitor 22, 115°C (239°F) on the Monitor 41) either or both switches will open to shut down the heater. After extinguishing the flame, the Burner Status indicators continue to blink. The Overheat Protector Switches will automatically reset after cooling down.

Once the heater has cooled to 80°C (176°F), the system can be restarted. To restart the Monitor, proceed as follows:

A. Press ON OFF Switch to OFF.
B. Allow heater to cool.
C. Troubleshoot the cause of the overheat.
D. Press ON OFF switch to ON
E. Proceed with normal operation.

1-33 SLIDE SELECTOR FOR THE RESET TEMP.

Once power is restored after power interruption by power failure or by disconnecting heater plug from wall outlet, heater will resume operation in the MANUAL mode and maintain room temperature according to the setting temperature selected by using the selector for the reset temperature at the lower right hand side of the cabinet.

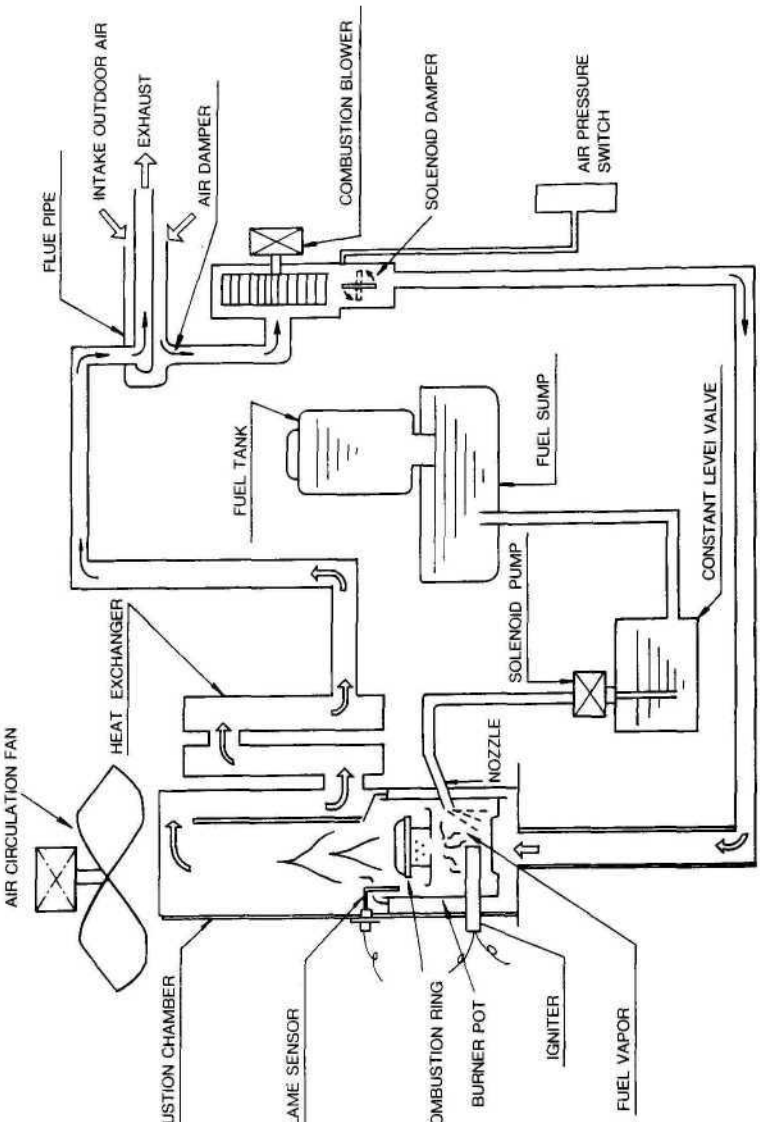


Figure 1-2 ELEMENTS OF COMBUSTION SYSTEM (MONITOR 22)

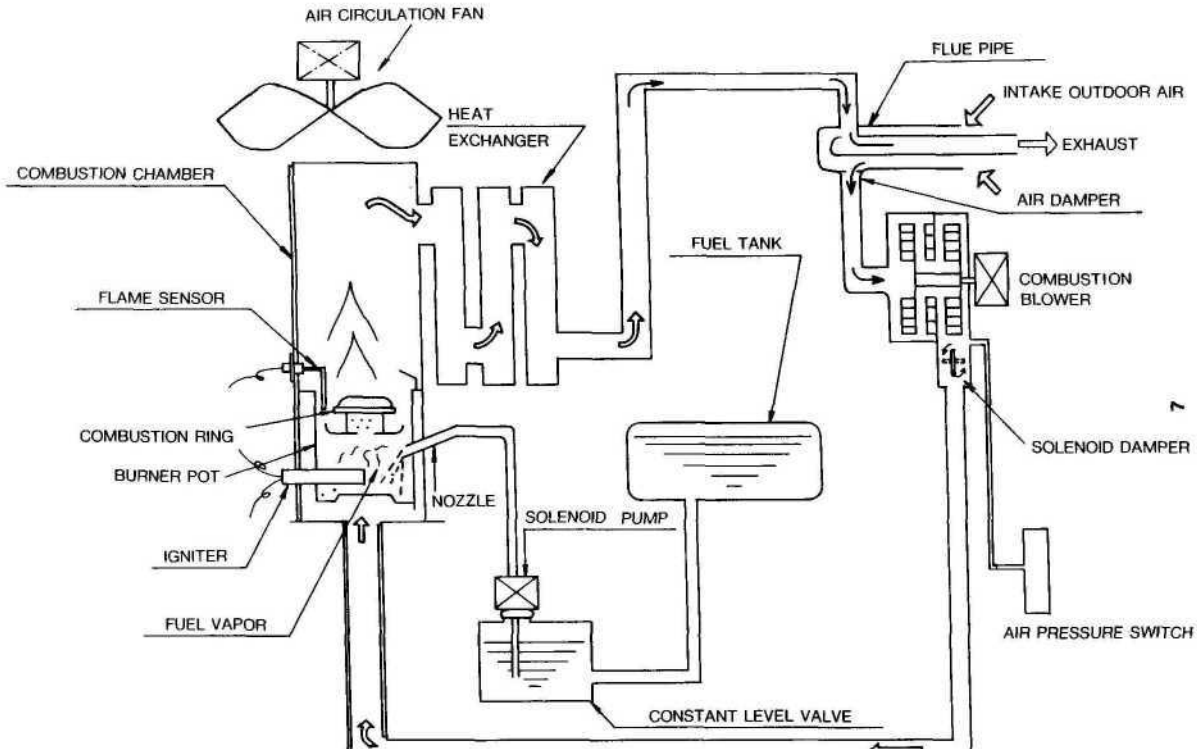


Figure 1-3 ELEMENTS OF COMBUSTION SYSTEM (MONITOR 41)

2-1 INTRODUCTION

Installing the Monitor System at the user's location can be performed quickly and economically. The Monitor 22 can be used as either an internally fueled (capsule tank) or remotely fueled System. The Monitor 41 model is strictly a remotely fueled system and both are externally vented. As such both need the installation of an externally vented intake exhaust system and if remotely fueled, will need the installation of a remote fuel storage tank.

By completing each step of the easy-to-follow installation instructions (each step should be completed in the exact order specified). the Technician is directed through the installation process.

This section contains all relevant installation information including:

- — Installation specifications
- — List of installation tools
- — Alternative types of venting systems (and installation procedures for each)
- — Basic requirements for fuel tank installation
- — Instructions to install the Monitor System

IMPORTANT: Before beginning installation of the Monitor vented heating system (including any electrical wiring and fuel supply equipment), check local building,electrical, mechanical and fire codes. The requirements of these codes must be followed to insure lawful installation and use.

The heater can be located almost anywhere within the dwelling provided that electrical, fuel, and exhaust specifications are met.

2-2 PHYSICAL PLACEMENT OF HEATER

In addition to the space taken up by the heater, interior space must also be reserved for free air circulation. Remove all combustibles from the heating area.

Unless building or fire codes dictate otherwise, the Monitor system can be placed on any floor surface (including carpeting or other combustible material) and provide safe operation.

2-3 DRILLING REQUIREMENTS

Through-the-wall Flue Pipe installation requires that a 2 ½" (65mm) hole be drilled through the dwelling wall (interior to exterior). The hole must be pitched downward toward the outside at an approximate angle of 2 (about ¼" per foot). The appropriate wall area (in which hole will be drilled) must contain no internal obstacles such as piping, wiring, air ducts, or studs.

RECOMMENDED TOOL KIT FOR MONITOR HEATER SERVICE TECHNICIANS

1) =2 Phillips Head Screwdriver
2) Steel Tape Measure
3) Felt Tip Pen or Pencil
4) Caulking Material (exterior grade)
5) Electrical Drill
   (reverse capability recommended)
6) Hole Saw, Saber (Jig) Saw, or other appropriate tool for cutting a 2.5" diameter hole for flue pipe
7) Rubber Clipping Tool
8) Long Drill Bit—¼"
9) =2 Standard Screwdriver
10) Adjustable Wrenches (various sizes)
11) Copper Tubing Cutter
12) Copper Tubing Flaring Tool
13) V.O.M.(Volt, OHM. Meter with shielded probes)
14) Level
15) Plumber's Pipe Thread Tape
16) Small assortment of Self-Tappeng Screws
17) Assorted Pliers (Slip Joint, Needlenose, Cutting, Lock Joint)
18) Phenolic Probe or Insulated Screwdriver
19) Supply of 125V, 2 and 10 Amp fuses
20) Floor mat to cover carpeting
21) Quart size pan for draining fuel

2-4 POWER REQUIREMENTS

WARNING

THE MONITOR POWER CORD MUST BE PLUGGED INTO A DIRECTLY ACCESSIBLE WALL OUTLET. DO NOT USE AN EXTENSION CORD TO MAKE THIS ELECTRICAL CONNECTION.

Line current to the system should be 120 VAC at 60 Hz. The electrical system should be protected against current overload by means of at least a 15-ampere fuse or circuit breaker.

NOTE: The wall outlet should supply electricity for the Monitor system only. Do not connect any other electrical appliance to it.

CAUTION: In some installations, it may be best to hard-wire the heater to the house circuits. A competent, licensed electrician should do this.

2-5 FUEL TANK REQUIREMENTS

WARNING:

INSTALLATION OF ANY REMOTELY LOCATED FUEL TANKS MUST COMPLY WITH ALL LOCAL STANDARDS AND OR BUILDING CODES.

Heater fuel (crystal clear kerosene only) can be stored in remotely located storage tanks ranging from 55 gallon drums to 275 gallon tanks. When using large tanks a pressure regulator with a max. of 2.5 PSI should be installed near heater inlet.

CAUTION: In some installations, it may be better to install permanent fuel tank plumbing. A licensed Plumber should do this.

2-6 TEMPERATURE SENSOR WIRING REQUIREMENTS

A wall-mounted temperature Sensor gauges room temperature and automatically regulates the heating cycles of the Monitor System.

The standard sensor wire is 6' ,' long and can be left mounted on the back of the cabinet as shipped. If this is not practical the sensor can be mounted on a wall.

CAUTION: If sensor is to be mounted remotely be careful not to place it in direct sunlight, on uninsulated exterior walls in drafty areas etc., as this will create an inaccurate temperature reading.

2-7 BUILDING CODES

Fire regulations, electrical and other local building codes may govern the installation and use of a vented heater and related fueling systems. Prior to installation, check and comply with all codes.

2-8 UNPACKING

Save all shipping materials until the Monitor has been completely installed and is working properly.

A. Cut the two plastic ribbons that hold the shipping carton together.
B. Remove the top.
C. Remove from the shipping carton the Cardboard (drilling) Template and the Owner's Guide.

NOTE: The Dealer should complete the Registration Card at time of customer purchase and return it to Monitor Products, Inc. as soon as possible.

D. Remove the spill tray from shipping carton, and remove the plastic bag.
E. Remove the plastic bag covering the hearer.
F. Remove the plastic bag containing the heater parts,and set it aside.
G. Remove the Flue Pipe from the rear of the heater. When ready to install, separate Flue Pipe from cardboard packing materials.
H. Firmly grasp cabiet handles (one on each side of heater cabinet) and lift heater off the cardboard shipping base.
I. Check for parts as listed in Monitor Owners Guide.

IMPORTANT: Only the standard-size Flue Pipe is shipped with the heater. The Monitor dealer will also stock Medium Flue Pipes, Window Kits, Extension Kits, and other accessories that may be required for non-standard installations.

2-9 HEATER INSTALLATION

In choosing a location for your heater, the following guidelines must be considered:

- The heater MAY be installed on combustible floors.
- The area around the heater should be free of obstacles that might interfere with the free flow of air.
  Allow the clearances shown in Figure 2-1.
- The heater must not be installed in a combustible fireplace.
- An AC wall outlet must be within reach of the heater's power cord. Extension cords must not be used.
- The area outside where the flue pipe will emerge should be free of foliage, fuel storage tanks and flammable objects. Air should circulate freely in the area. Allow the clearances shown on following page.
- The wall where flue pipe hole will be cut should be free of plumbing pipes, electrical wires, studs, air ducts and other obstacles.

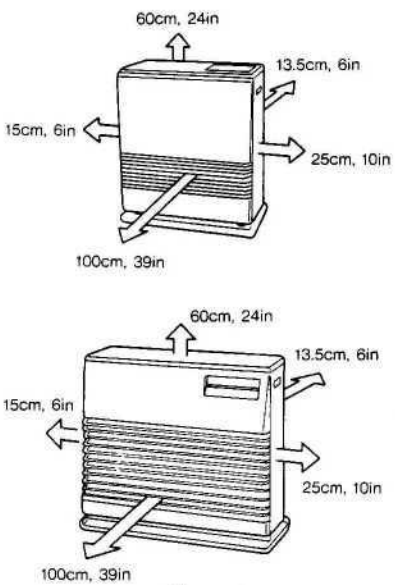


Figure 2-1

NOTE: After using the installation template as a guide for drilling the flue pipe hole, the Monitor Flue Pipe can be normally installed according to the illustration procedure in the Monitor Manual.

Just in case the template was misplaced, the approximate flue pipe hole location measurements are as follows:

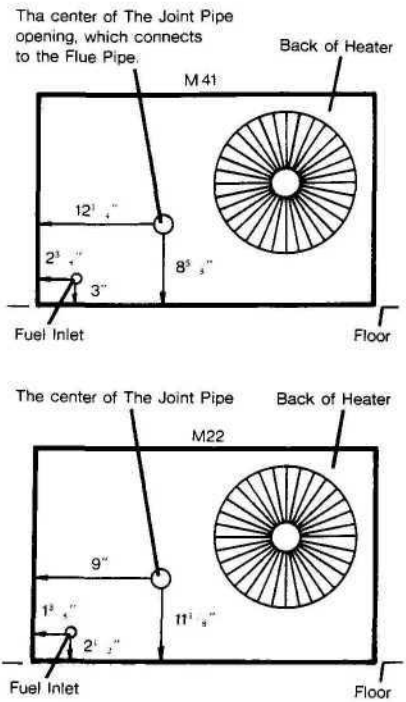


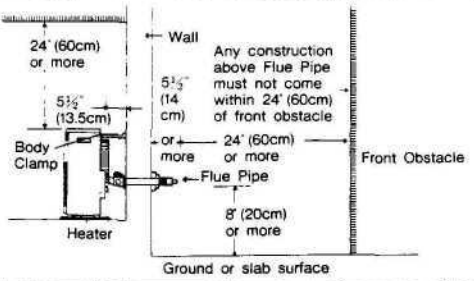
Figure 2-2

FLUE PIPE CLEARANCES

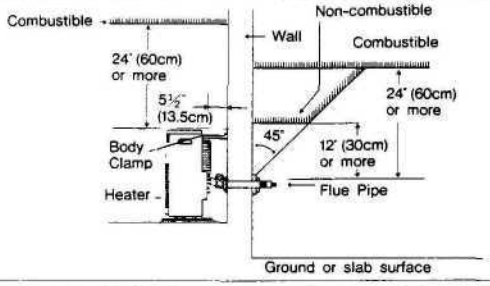
Flue pipe installations should provide for venting to an unconfined space through which there is a free flow of outdoor air. Clearances to adjacent walls or obstacles must comply with the requirements shown below.

Frontal Clearance

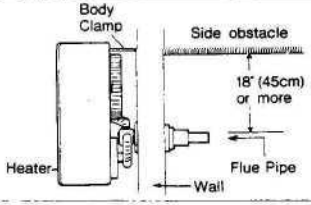
⚠CAUTION:
Do not attach anything onto the outlet of the flue pipe.



Overhead Clearance



Side Clearance



IMPORTANT:

In open area with strong wind, a wind break may be necessary.

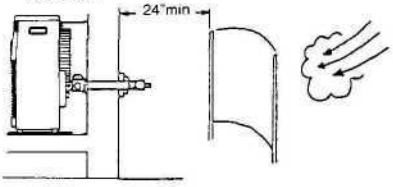


Figure 2-3

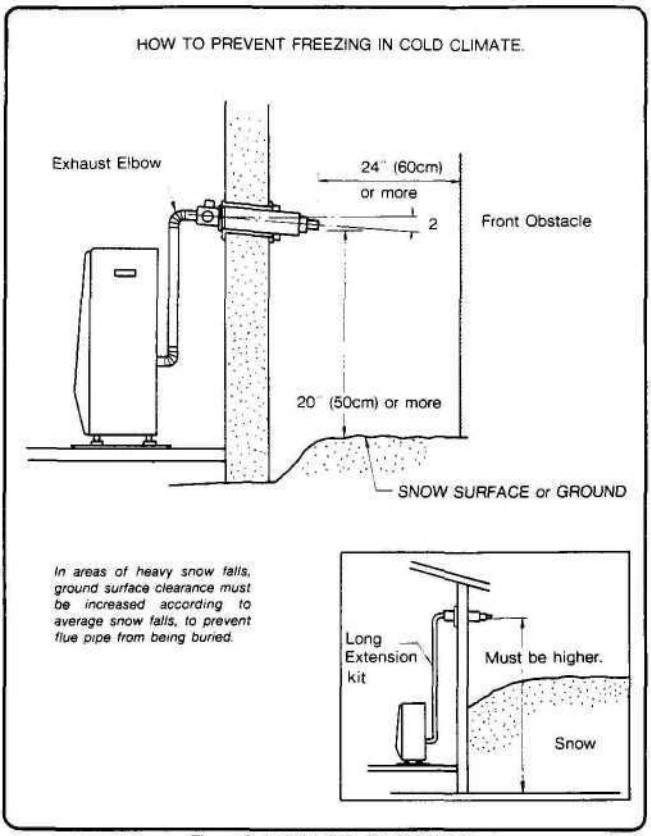


Figure 2-4 FLUE PIPE CLEARANCES

INSTALLATION OF FLUE PIPE WINDOW KIT

A window kit makes it possible to vent the heater from dwellings in which through-the-wall venting is neither practical nor possible.

The Window Kit is available in two sizes. The Short Window Kit accommodates windows from 20 to 32" wide; the Long Window Kit accommodates windows from 31 to 50" wide.

NOTE: The procedure below describes how a Window Kit is installed in a double-hung window. The Window Kit can also be installed in a vertical, sliding type window.

Install the Window Kit in the manner outlined below:

STEP 1: Install Flue Pipe in Window Kit

A. Push the rubber seal into the Flue Pipe hole on the window kit frame. The hole on the seal should be positioned at the exterior side of the frame.

B. Using the four (4) Phillips head screws, fasten the spacer to the frame.

C. With the arrow on the Flue Pipe pointing UP, align the screw holes on the Flue Pipe with those on the Spacer. Secure with three (3) phillips head screws.

STEP 2: Install Window Kit in the Window

IMPORTANT: Prior to installation, clean the window frame of all dust, dirt, and debris.

A. Raise the lower window
B. Place the window kit frame into the innermost track of the window.
C. Expand the frame until it fits loosely within the width of the window; it may be necessary to loosen the large set screw on the frame in order to do so.
D. Slightly lift window kit frame. Slide the L-Adapter under the frame and position it at the point where the inner and outer frame meet.
E. Expand the frame to fit the window tightly. Adjust the position of the L-Adapter, if necessary. Tighten the set screw to secure the frame. Secure the L-Adapter to the window sill with two (2) wood screws.
F. Lower the window firmly down upon the top of the Window Kit frame.
G. Measure the width of the upper (outer) window (which is located in the outer track). Cut a length of the Rubber Packing to this size. Remove the protective backing and firmly mount it onto the underside of the outer window.

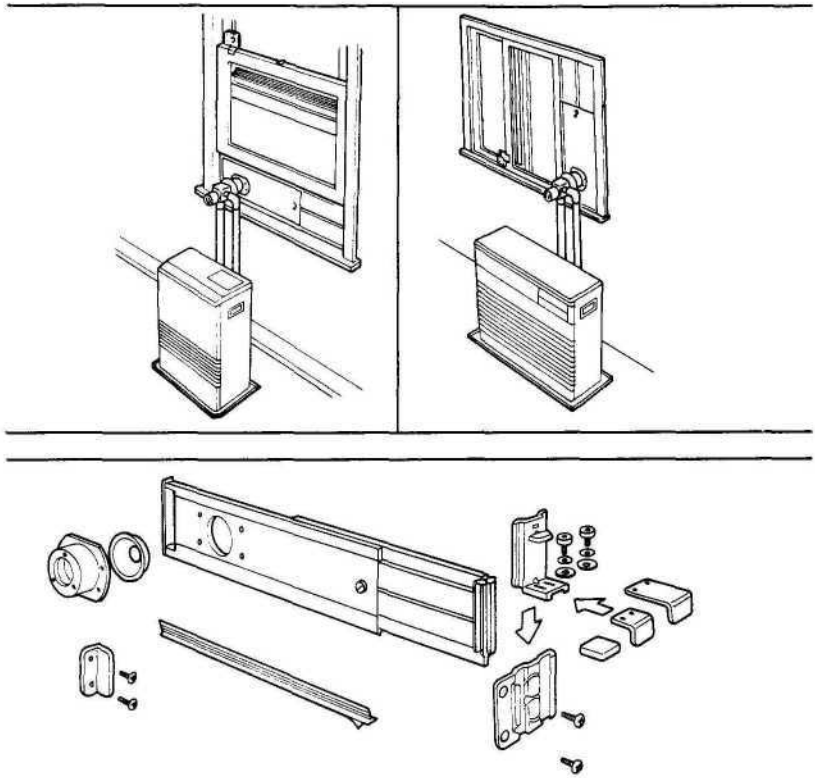


Figure 2-5

STEP 3: Install Window Lock

A special window lock replaces the usual clam-shell lock.

To install the window lock, proceed as follows:

A. Turn locking lever to left and disengage lock from lock bracket.

B. Attach lock bracket to left-hand side of upper window frame. Use the two wood screws provided.

NOTE: If the lock bracket prevents the lower window from sliding upward, notch the bracket into the upper window frame.

C. Slip lock into lock bracket.

IMPORTANT: Window can be locked by turning locking lever to right; to open, turn locking lever to left and remove lock from bracket.

D. Two adjustable-position stops are supplied to accommodate various window sash thicknesses. If short stop is too small, remove two retaining screws and brackets which hold the short stop to the underside of the lock. Remove the short stop and substitute the long stop. Adjust to proper position, and secure with screws and washers previously removed. (Before securing the stop to the window, remove the protective backing and firmly stick the stop packing onto the underside of the stop.)

NOTE: Windows with deep sills may require the use of an extra intake and exhaust elbow to provide clearance for flue pipe hook up. A piece of the air intake line can be cut to join the two intake elbows together.

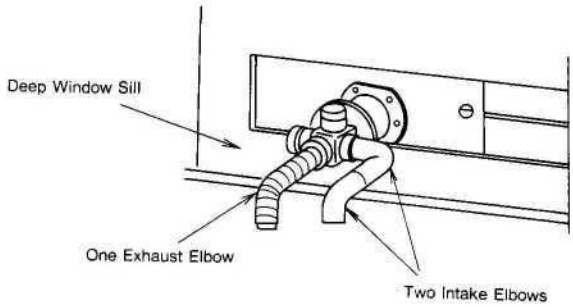


Figure 2-6

2-10 INSTALLING AN EXTENSION KIT

Installing an Extension Kit requires the construction of an air line and the exhaust line. The air line is connected between the Air Supply Elbow at the rear of the heater and the air inlet port on the Flue Pipe. Similarly, the exhaust line is connected between the joint pipe at the rear of the heater, and the exhaust port on the Flue Pipe.

IMPORTANT: The PVC air line is longer than the exhaust line and may need to be cut to size. Be sure, however, to thoroughly deburr all rough edges.

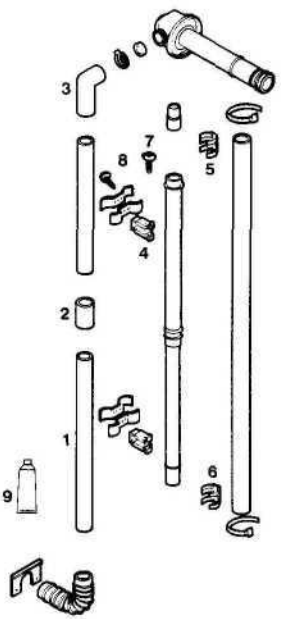
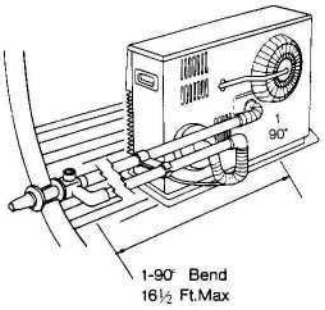


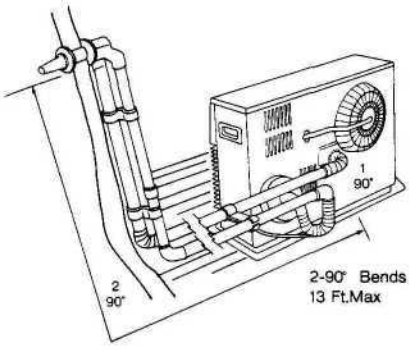
Figure 2-7 COMPONENTS OF EXTENSION KIT

ITEM=	DESCRIPTION	ITEM=	DESCRIPTION
1	PIPE, Air supply	6	PIPE CLAMP, Bottom
2	JOINT, Air line	7	SCREW, Legs, mounting
3	ELBOW 90 Air line	8	SCREW, Pipe Clamp
4	LEG, Wall-standoff	9	BOND, Adhesive
5	PIPE CLAMP, Top		

Max lengths and bends allowable using extension kits.

Extension kits are available in four diffirent lengths. For exact dimensions refer to the accessories catalog.





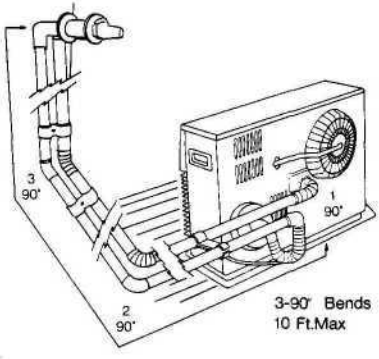
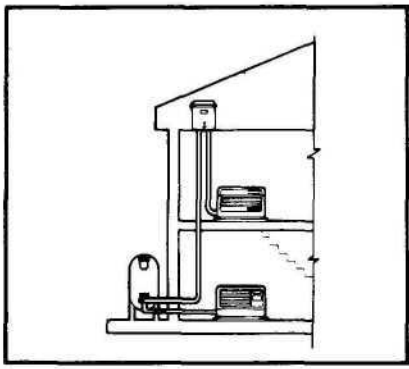


Figure 2-8 MAX LENGTHS AND BENDS ALLOWABLE USING EXTENSION KITS

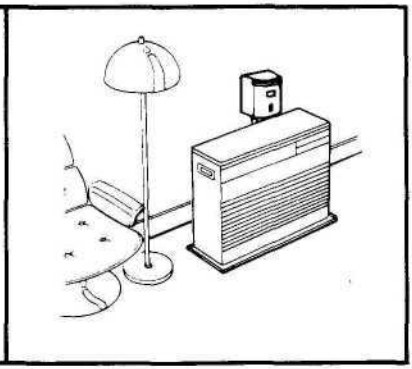
2-11 TYPICAL MONITOR LIFTER PUMP INSTALLATIONS

For more detailed information look under Kerosene Lifter manual.

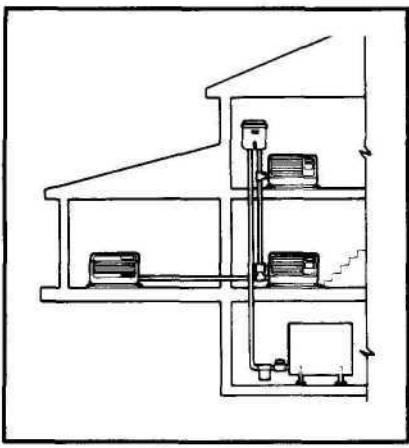
NOTE: The same minimum and maximum pump heights must be maintain as is with other fuel tanks. Figure 2-12



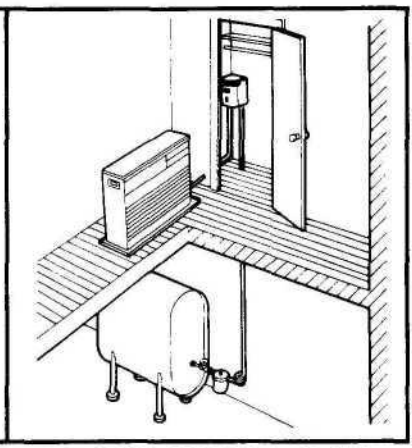
MONITOR™ KEROSENE LIFTER



MONITOR™ KEROSENE LIFTER (CAN BE POSITIONED BEHIND UNIT)



MONITOR™ KEROSENE LIFTER



MONITOR™ KEROSENE LIFTER GRAVITY

Figures 2-9

2-12 USES FOR THE ELBOW ADAPTER KIT

Convert from Monitor 20 30 to 22 41 using an elbow adapter Kit (part=8213) and utilizing existing flue pipe installation.

PARTS LIST EXPLODED

Ref. No.	Name of Part	No in Unit
1	Exhaust Pipe Clamp	
2	Exhaust Elbow	1
3	Exhaust Joint	1
4	Joint Supporter	1
5	Heat Insulation Cover	1
6	Self-Tapping Screws	2
7	Hose Clamp (this part comes with your Monitor™ Heater)	
8	Air Damper (this part comes with your Monitor™ Heater)	
9	Flue Pipe (this part comes with your Monitor™ Heater)	

A. Remove Monitor 20 30 heater and flue pipe.
B. Install Monitor 22 41 flue pipe into sleeve.
C. Slide the exhaust elbow onto the exhaust port opening on the rear of the heater. (To locate exhaust port opening, see your Monitor Owner' s Guide.)
D. Secure the exhaust elbow by attaching the exhaust pipe clamp to the heater cabinet with two self-tapping screws.
E. Cover the adjustable exhaust pipe with heat insulation cover.

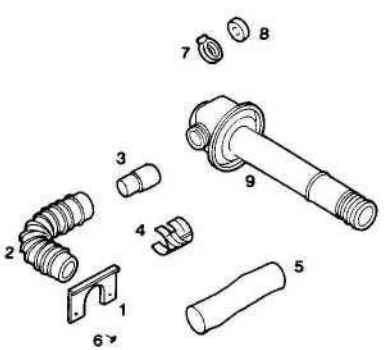


Figure 2-10

F. Remove metal cap on side mounted exhaust port of flue pipe and replace into the port (the Monitor 22 41 is now ready to be positioned into place.)

NOTE: Be sure the exhaust elbow is firmly fixed on the flue pipe with a joint supporter.

G. Insert air supply elbow opening over flue pipe air intake flange and secure with hose clamp.

NOTE: The Standard Air Damper is installed over the flue pipe "air intaka flange." (To locate flue pipe "air intaka flange", see your Monitor™ Owner's Guide.)

Elbow adapter kits may also be used to raise a flue pipe high enough to clear certain base board heating systems.

2-13 FUEL TANK INSTALLATION

Pictorial views of alternative types of storage facilities and delivery systems are illustrated (Figure 2-12).

Since fuel storage tank installation techniques vary from place-to-place (often dependent upon applicable codes), a particular installation procedure cannot be specifed. However, certain criteria govern the fuel hook-up of the Monitor. Use the following check list as a guide to the fuel storage facilities:

WARNING:

USE ONLY CRYSTAL CLEAR KEROSENE. NEVER USE GASOLINE, WHITE GAS, CAMP FUEL OR OTHER FLAMMABLE LIQUIDS. USE OF SUCH FUELS CAN RESULT IN AN EXPLOSIVE FIRE AND CAUSE SEVERE INJURY.

Fueling Options Available

Fueling of the Monitor Heating Systems can be accomplished in one of 3 ways:

1. Capsule Tank (on the Monitor 22).
2. Gravity Fed Large Capacity External Tank: Practical for large heating needs where bulk delivery of kerosene is available. This system should be installed by a qualified plumber or fuel supply technician.
*3. Large Capacity External Tank with Pump: For large heating needs where a gravity fed system is not practical. An electric pump, the Monitor™ Kerosene Lifter, especially designed for use with Monitor heating systems.

*if a pumping system is used is used to supply fuel, the inlet pressure to the heater must not exceed 2. 5 psi.

To install a large capacity, gravity fed external tank, follow the instructions below. Use of a qualified installer is recommended.

- Installation height of the bottom of the fuel tank should be 16 inches or more above the floor surface on which the heater stands. This insures that inlet fuel pressure will be sufficient. The top of the fuel tank should be no higher than 8½ feet above the floor under the heater. This insures that inlet fuel pressure will not be excessive.
- The horizontal length of piping should not exceed 100 feet and should be free of sharp bends or obstructions.
- Piping should include no inverse U-type bends (to avoid air locks, which could block the fuel supply).
- Only ¼ inch OD copper tubing should be used. The tubing should be bent carefully to avoid crimping.
- A fuel filter is recommended for use on the fuel line near tank, and a shut-off valve should be installed at the tank.
- Flare connections should be used at the fusible link valve connection on the heater and at the fuel filter to be installed at the tank.
- The fuel tank should be located no closer than 6 feet to a source of heat.
- The fuel tank should have an opening for filling on the top and a vent with a weather-proof cap on the side. On some tanks the vent and fill spout use the same opening.

55, 100, and 250 gallon tanks must contain:

- Shut-off valve at tank outlet
- Disposable fuel filter (protects heater against condensation and other impurities)
- Fueling inlet (protected by weather-proof cap)
- Ventilation outlet
- Clearance of at least 6' from any source of heat

Allowable Height Dimensions:

- Bottom of tank-at least 16" above floor holding heater (maintains sufficient pressure)
- Top of tank-maximum of 8½' above floor holding heater (prevents excessive line pressure)
- Position of Lifter-more than 8' above fuel inlet of heater requires pressure reduction valve.

RECOMMENDATION

Pipe fittings in the fuel supply to the Monitor heating systems should be sealed with pipe thread tape. The supply line from the tank to the Monitor™ Kerosene Lifter must be absolutely air tight. 275 gallons and bigger tanks should have a 2.5 P.S.I. max pressure reducer to avoid excessive pressure at heater inlet.

2-14 HEATER INSTALLATION

The Monitor heaters can be physically situated on carpeting or other combustible flooring with complete safety. The selected heater site must be accessible to an electrical outlet, must support free air ciculation (both internal and external), and must not contain combustible materials in the heater's immediate vicinity.

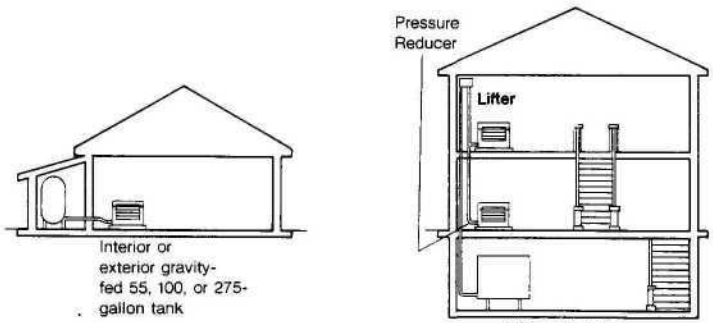


Figure 2-11 ALTERNATIVE SOURCES OF FUEL STORAGE

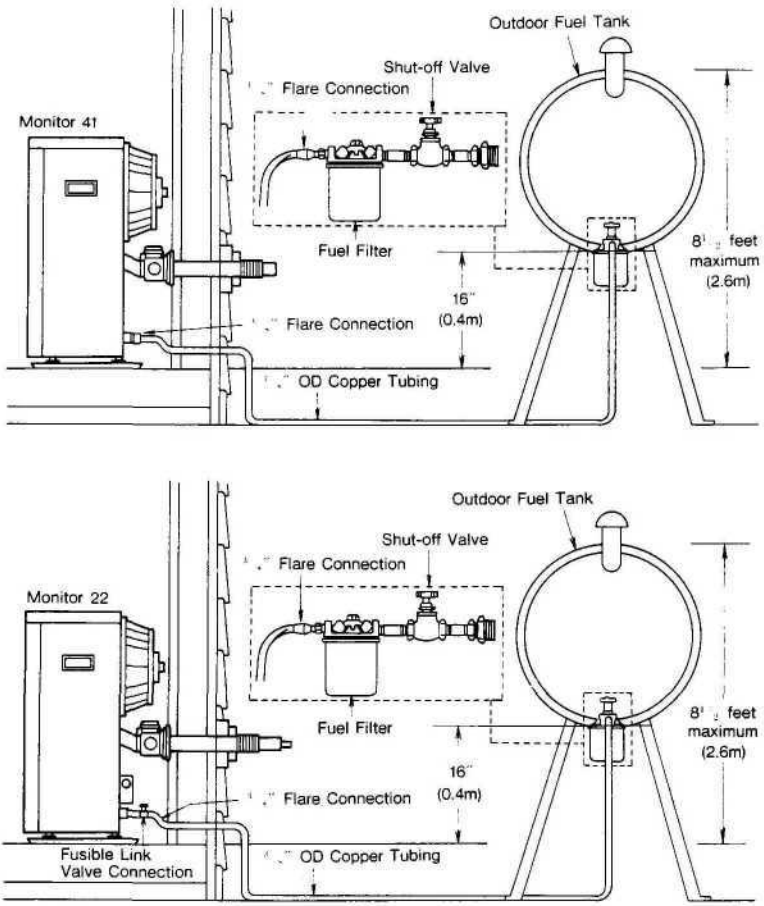


Figure 2-12 TYPICAL FUEL LINE CONNECTIONS

3-1 INTRODUCTION

Monitor is an easy-to-operate vented kerosene heater. Routine operation features high BTU output, automatic adjustment of room temperature, low fuel and power consumption, and choice of automatic or manual heater operation.

This section provides all information necessary to operate the Monitor Heating System. All operation procedures specified should be performed in the order in which they are described.

3-2 OPERATING SPECIFICATIONS

The following specifications apply to the operation of the Monitor 41 and the Monitor 22:

Monitor 41

- Rated Efficiency (as applied to kerosene heaters): 93%*
- Rated Efficiency (as applied to central heating systems): 87%
- Power Consumption : as follows

	HIGH	MEDIUM-HIGH	MEDIUM-LOW	LOW
IGNITION	E 3N	BURN	BURN	BURN
340watts	65watts	62watts	58watts	58watts

- Circulation Fan Output : 388 cubic feet min.
- Fuel source : Remote, separate tank
- Potential heating area : 900-3200 sq. feet

*The energy from the combustion process is released in the form of heat and vaporized water. Normally, heating systems discharge water from combustion to the atmosphere without condensing it. This 93% efficiency rating means that, assuming the water cannot be condensed, 93% of the heat produced by the combustion process is recovered. Assuming the water can be condensed, the efficiency is 87%.

NOTE: Actual effective heating area depends upon numerous factors such as type and severity of climate, type of dwelling construction, condition of dwelling, and thickness and effectiveness of dwelling insulation.

Table 3-1 lists Monitor 41 performance specifications at various user-selected heat output settings.

Table 3-1 HEATER PERFORMANCE SPECIFICATIONS

Specification	Setting			
	Low	Medium Low	Medium High	High
Rating	16,200	21,000	33,900	43,000
Heater Output hr.	15,000	19,500	31,500	40,000
Fuel Consumption (gal hr)	0.12	0.16	0.25	0.319
8-hrs day burntime (5-gal. tank)	5.2days	3.9days	2.5days	2.0days
Continuous-use burntime (5-gal.tank)	41.7hrs.	31.3hrs.	20hrs.	15.7hrs.
8-hrs day burntime (55-gal.tank)	57.3days	43days	27.5days	21.6days
Continuous-use burntime (55-gal.tank)	19.1days	14.3days	9.2days	7.2days
8-hrs day burntime (275-gal.tank)	286.5days	214.8days	137.5days	107.8days
Continuous-use burntime (275-gal.tank)	95.5days	71.6days	45.8days	35.9days

Monitor 22

- Rated Efficiency (as applied to kerosene heater): 93%*
- Rated Efficiency (as applied to central heating systems): 87%
- Power Consumption : as follows

	HIGH	MEDIUM-HIGH	MEDIUM-LOW	LOW
IGNITION	BURN	BURN	BURN	BURN
250watts	52watts	51watts	50watts	50watts

- Circulation Fan Output : 176 cubic feet min
- Fuel source : 1.32 U.S. gal., separate tank optional
- Potentional heating area : 600-2000 sq. feet

Table 3-2 lists Monitor 22 performance specifications at various user-selected heat output setting.

Table 3-2 HEATER PERFORMANCE SPECIFICATIONS

Specification	Setting			
	Low	Medium Low	Medium High	High
Rating	9,600	11,700	17,400	22,000
Heater Output hr.	8,900	10,900	16,200	20,400
Fuel Consumption (gal hr)	0.07	0.09	0.13	0.164
8-hrs day burntime (1.32-gal. tank)	2.4days	1.8days	1.3days	1.0days
Continuous-use burntime (1.32-gal.tank)	18.9hrs.	14.7hrs.	10.2hrs.	8.0hrs.
8-hrs day brntime (55-gal.tank)	98.2days	76.4days	52.9days	41.9days
Continuous-use burntime (55-gal.tank)	32.7days	25.5days	17.6days	14.0days

3-3 OPERATING CONTROLS AND INDICATORS

Several controls and indicators are used to operate the heater and to monitor its performance as follows:

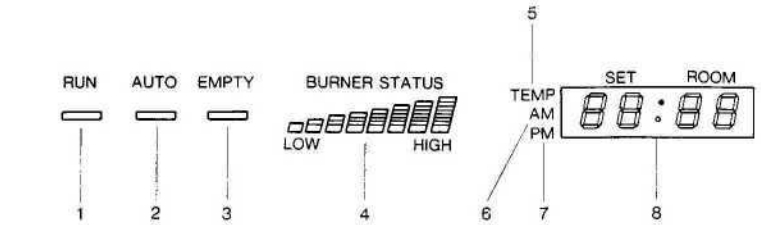


Figure 3-1, INDICATORS

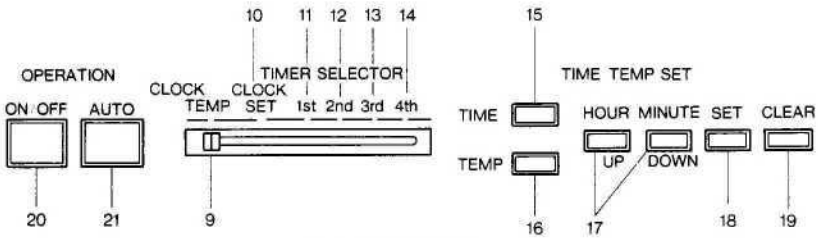


Figure 3-2, CONTROLS

FIGURE AND ITEM NO	CONTROL OR INDICATOR.	FUNCTION
Figure 3-1, Item1	RUN Indicator Light	Light to indicate that power has been apllied to heater. Illuminates when operation ON OFF push-button switch is pressed to position ON
Figure 3-1, Item2	AUTO Indicator Light	Lights when heater runs in automatic mode. AUTO, RUN, and appropriate BURNER STATUS Indicators are illuminated simultaneously if heater is burning.
Figure 3-1, Item3	Empty Indicator Light	In case of using the cartridge tank, when the fuel is empty, EMPTY Indicator Light blinks. This Light is not provided with Monitor 41.
Figure 3-1, Item4	BURNER STATUS Indicator Lights	Light in accordance with heat output as follows: Heat Output — Light Pattern High — 8indicators-ON Medium High — 6indicators-ON Medium Low — 4indicators-ON Low — 2indicators-ON

FIGURE AND ITEM NO	CONTROL OR INDICATOR.	FUNCTION
Figure 3-1, Item5	TEMP Indicator Light	Lights when heater is running and Digital Window is showing the temperature.
Figure 3-1, Item6	AM Indicator Light	
Figure 3-1, Item7	PM Indicator Light	
Figure 3-1, Item8	Digital Display	Indicates SET and ROOM temperature when heater is running, and indicates time when heater is Off. Indicates time and temperature for automatic operation setting.
Figure 3-2, Item9	TIMER SELECTOR CLOCK TEMP position	Displays set and current room temperature when heater is ON. Displays current time (after time has been programmed) when heater is OFF. Prior to programming, 88:88 is displayed on clock. **NOTE:** During routine heater operation, the selector switch is normally set to this position.
Figure 3-2, Item10	CLOCK SET position	Programs current time on Clock by use of HOUR and MINUTE push-button switches. **NOTE:** Prior to programming current time, Digital Display shows 88:88. **IMPORTANT: Once current time has been programmed, press the SET pushbutton switch with in 60 seconds.Otherwise clock display will revert to previously programmed time, if any.**
Figure 3-2, Item11	1ST Position	Programs first automatic heater operation. When programmed, heater automatically operates at specified time and temperature (i.e. 6: 00 a.m., 70°F), if set for AUTO, providing that heater has been set for automatic mode of operation. TIME, TEMP, HOUR(UP), MINUTE(DOWN) and SET push-button switches are used to program first operated time and temperature. **IMPORTANT: Once time and temperature have been programmed, the SET push-button switch must be pressed with in 15seconds. Otherwise, time and temperature will revert to previously programmed time, if any.** When selector switch is set to this position, 1st presently programmed time and temperature are displayed.
Figure 3-2, Item12	2ND Position	Programs second automatic heater operation as same as 1st position.

FIGURE AND ITEM NO	CONTROL OR INDICATOR.	FUNCTION
Figure 3-2, Item13	3RD Position	Programs third automatic heater operation as same as 1st position.
Figure 3-2, Item14	4TH Position	Programs fourth automatic heater operation as same as 1st position.
Figure 3-2, Item15	TIME push-button switch	This switch is used to set time and change display over.
Figure 3-2, Item16	TEMP push-button switch	This switch is used set temperature and change display over.
Figure 3-2, Item17	HOUR UP, MINUTE DOWN *repetitive-action* push-button switch	Programs time or temperature. **NOTE:** Each time push-button switch is *pressed, the digit advances in incre*ments of one digit, If push-button is pressed and held, the degits are advanced repetitively.
Figure 3-2, Item18	SET push-button switch	"Sets" time and or temperature. *If this control is not pressed after time and or* temperature have been programmed, the time and or temperature programmed (as indicated by display window) will not be accepted, and will revert to previously programmed time and/ or temperature.
Figure 3-2, Item19	CLEAR push-button switch	Erases programmed time and temperature. When cleared, time and/or temperature previously programmed and displayed disappear(s) from window. **IMPORTANT: Both current time and automatically programmed time(s), temperature(s) will have to be reprogrammed if electrical operation is interrupted by power failure or by disconnecting heater plug from wall outlet. If this occurs, the heater will go into MANUAL mode of operation and maintain room temperature according to the setting temperature you've selected by using the slide silector for the reset temperature at the lower right hand side of the cabinet.**
Figure 3-2, Item20	*ON OFF* push-button switch	ON position (push-button is "in")applies power to the unit. When this occurs, the RUN indicator lights to indicate that heater operation has begun. OFF position (push-button is "out") remove *power from the heater. All circuits-except for* Clock and Air Flow — are shut down.

FIGURE AND ITEM NO	CONTROL OR INDICATOR.	FUNCTION
Figure 3-2, Item21	AUTO push-button switch	Places heater in automatic mode of operation. AUTO indicator lights to confirm automatic operation. Assuming that the heater has been properly programmed and heater is in ON position, heater will operate automatically. When pressed again, AUTO indicator goes out and then heater will operate in MANUAL mode. During manual operation, the user turns heater ON and OFF, at will.

3-4 PRE-OPERATION CHECK LIST

After heater installation, but prior to Monitor heater start-up, inspect the system for operational readiness. The following check list specifies those items that should be inspected on a routine basis:

- Check that the Monitor heater is plugged into wall outlet (120 Vac, 60 Hz)
- Verify that adequate supply of kerosene is available in fuel tank
- Confirm that fuel is free of water or other contaminants
- Check fuel tank for good operating condition; it must be free of rust, corrosion, and or leaks
- Inspect Fuel Line for signs of leaks, loose connections, cracks, air pockets or blockages
- Confirm that Fuel Valves on Fuel Tank and Fusible Link Valve are open so fuel can flow freely
- Outside dwelling, check area immediately around Flue Pipe for combustibles or obstructions to free air circulation
- Inspect Air Line for cracks, loose connections or blockage
- Check Exhaust Line for cracks, loose connections or blockage
- At rear of heater, verify that air flow to the Air Circulation Fan is not blocked
- Inspect dwelling interior and confirm that immediate area near heater is free of combustible and objects that might interfere with free air flow.
  Make certain that Heat Sensor is not exposed to drafts, direct sunlight, nor direct heat from the Monitor.
- Confirm that heater is level

If this inspection reveals any system deficiencies, correct the problems before operating the heater.

3-5 OPERATION

Operation of Monitor heater can be controlled manually by the user, or run automatically by the microprocessor.

Paragraphs 3-6 through 3-10 provide the details of heater start-up, operation, and shutdown. The controls and indicators illustrated by Figure 3-1 and 3-2 are used to operate the system and to monitor the heater's performance.

3-6 MANUAL HEATER OPERATION

Operation of the heater is under the direct control of the user (heater will not operate automatically). The heater will, however, automatically respond to changes in room temperature signaled by the Heat Sensor to maintain the temperature of the room at a comfortable level.

NOTE: Resetting the Fuel Constant Level Valve is necessary only if the heater is being started for the first time, hasn't been used for an extended period of time, or if tank has run empty. If priming is unnecessary skip to step 2.

STEP1: Prime the Heater

Gently press and release the Fuel Constant Level Valve Reset Lever four or five times.

STEP2: Select Manual Operation

If heater operation is in AUTO mode, press the AUTO push-button switch and change Auto to Manual mode.

STEP3: Select Temperature Setting

Press the TEMP push-button switch and press either the UP or DOWN push-button switch to set the digital set room temperature indicator to the desired temperature, and then press the SET push-button switch.

IMPORTANT: In case no temperature is set, temperature will automatically be set at the setting temperature selected by using the slide selector for the reset temperature.

STEP4: Turn Monitor On
Press the ON OFF push button switch to position ON. The RUN indicator light illuminates to indicate that power has been applied to the instrument and the heater is cycled for manual mode of operation.

3-7 AUTOMATIC HEATER OPERATION

Automatic operation is established by programming the time temperature settings for specific times. On a daily basis, a maximum of four time temperature settings can be programmed.

If, subsequently, it should be desired to switch to manual mode of operation, the changeover can be made at any time.

Proceed with automatic mode of operation in the following manner:

STEP1: Program Clock for Current Time

A. Position TIMER SELECTOR slide switch at position CLOCK SET.
B. Press HOUR push-button switch to program current hour on the Clock.

IMPORTANT: Be sure to set clock for AM or PM, as appropriate.

NOTE: Both hour and minute digits on Display Window are advanced in increments of one by pressing the appropriate push-button switch one time for each digit; digits can also be advanced repetitively by pressing and holding the appropriate push-button switch.

C. Press MINUTE push-button switch to program the current minute(s) on Clock.
D. Immediately after programming current time in terms of hours and minutes, press the SET push-button switch.
E. Place TIMER SELECTOR slide switch in position CLOCK TEMP and verify that time displayed on Clock is the current time.

STEP2: Program the 1st Time Temperature

A. Slide TIMER SELECTOR slide switch to position 1st.
B. Press TIME push-button switch.
C. Press HOUR and MINUTE push-button switches to program 1st desired time.

IMPORTANT: Be sure to set the clock AM or PM, as appropriate.

D. Immediately after programming the 1st desired time, press the SET push-button switch. This step must be completed within fifteen seconds after programming the time.
E. Press TEMP push-button switch.
F. Press UP and or DOWN push-button switch(es) to program 1st desired temperature.
G. Immediately after programming the 1st desired temperature, Press the SET push-button switch. This step must be completed within fifteen seconds after programming the temperature.

STEP3: Program the Remaining Times
With the TIMER SELECTOR slide switch in the appropriate positions, program the 2nd, 3rd, 4th times as described above.

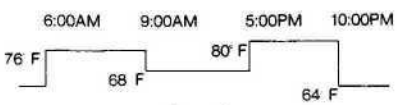
Be sure to press the SET push-button switch after each time is programmed.

IMPORTANT: Should heater power be interrupted by a power failure or by disconnection of the power cord, heater reverts to MANUAL operation, and all AUTO programming is erased.

STEP4: Select Automatic Operation
Press AUTO push-button switch. The AUTO indicator light will illuminate.

STEP5: Turn Monitor ON
Press ON OFF push-button switch to position ON. The RUN indicator light will illuminate to indicate that power has been applied to the heater.

From this point, heater operation is as follow example:



Example

3-8 REPROGRAMMING THE MONITOR HEATER

On occasion, it may be necessary to reprogram the Monitor.
Reprogramming is performed as specified below:

STEP1: Reprogramming Current Time
(if necessary)

A. Set the TIMER SELECTOR slide switch to position CLOCK SET.
B. Press HOUR and MINUTE push-button switches to program new current time. Set applicable time by watching Clock display.
C. Press SET push-button switch.

IMPORTANT: If SET push-button switch is not pressed, current time will revert to previously programmed time.

STEP2: Reprogramming Automatic Operation

A. Set TIMER SELECTOR switch to appropriate position (1st, 2nd, 3rd or 4th)
B. Press TIME push-button switch.
C. Press CLEAR push-button switch. Time displayed on window will disappear.
D. Using HOUR and MINUTE push-button switches program new desired time by watching the Display Window.
E. Press SET push-button switch.
F. Press TEMP push-button switch.
G. Press CLEAR push-button switch. Set Temperature displayed on Window will disappear.
H. Using UP and DOWN push-button switches program new desired temperature by watching the Display Window.
I. Press SET push-button switch.

3-9 HEAT SENSOR

Heat Sensor is located on the rear of the cabinet. It is recommended to leave the sensor in its original mounted position. However should relocation be necessary, choose a location for the sensor that is not in the path of direct sunlight, drafts or the flow of warm air from the heater. Loosen the screw and release the sensor from the rear of the cabinet. Fasten the sensor to the wall with the screw.

3-10 MONITOR SHUTDOWN

A simple one-step procedure is utilized to shutdown the Monitor:

Press ON OFF push-button switch to position OFF; the RUN indicator will extinguish.

IMPORTANT: Once heater has shut down, it cannot be restarted until post-purge cycle has been completed. If ON/OFF switch is left in position ON, Monitor operation will automatically restart upon completion of post-purge.

3-11 OUT OF FUEL

During either manual or automatic operation of heater, fuel in the tank may be depleted.

The Monitor (in case of using external fuel tank) is known to be out of fuel when all of the following *symptoms are present*:

- Burner Status indicator lights blink.
- Absence of flame (visually verified through view plate on wall of Combustion Chamber).

STEP1: Turn Heater OFF

Press ON OFF switch to OFF.

STEP2: Fill Fuel Tank

A. Close shut-off valve at outlet of Fuel Tank.
B. Drain Fuel Tank (from bottom, if possible) to remove all condensation, debris, and old fuel.
C. Fill Fuel Tank with fresh, crystal clear kerosene.
D. Upon completion of stepC, open shut-off valve which was closed in stepA above.

STEP3: Turn Heater ON

Press ON OFF switch to ON. Proceed with normal heater operation.

The Monitor 22 (in case of using capsule fuel tank) is known to be out of fuel as follows:

When the EMPTY indicator light illuminates and flashes, a buzzer will sound for twenty seconds. The burner mode is changed to "Low" automatically, and then, the heater will shut off after 30 minutes.

The remaining burning time is indicated at the Display Window.

Refueling:

STEP1: Turn Heater OFF

Press ON OFF switch and wait 15 minutes for the heater to cool.

STEP2: Lift Out the Capsule Fuel Tank

Open the tank cover and lift out the capsule fuel tank.

Turn the tank upside down, and remove the fuel cap.

STEP3: Fill the Capsule Fuel Tank

Fill the capsule fuel tank with fresh, crystal clear kerosene by using a siphon.

STEP4: Reinstall the Capsule Fuel Tank

Replace and tighten the fuel cap. To insure proper fuel flow, be sure the cap is secured correctly.

Install the tank with the arrow pointing forward, and close the tank cover.

STEP5: Turn Heater ON
Press ON OFF switch to ON. Proceed with normal heater operation.

3-12 RECOVERY FROM A POWER FAILURE

The Monitor is equipped with an automatic reset feature which restores (the manual mode of) operation following interruption of power to the heater. Note, however, that a power-failure automatically triggers a cooling and purge cycle: routine operation will automatically be resumed following purge cycle.

A switch to manual mode is automatic because the absence of power to the microprocessor wipes-out the programmed memory.

To recover from a power failure (automatic mode of operation), proceed as listed below:

STEP1: Program Current Time

STEP2: Program Automatic Time Temperature operation cycles.

STEP3: Return to Automatic operation.

3-13 RECOVERY FROM OVERHEAT CONDITION

The Monitor is protected against damage resulting from an overheat condition by two 110°C (Monitor 22), 115°C (Monitor 41) automatic reset thermostats.

In the event of an overheat the thermostats are triggered to cut off the flow of kerosene to the Burner Pot, the flame is extinguished automatically, and user is alerted to the overheat condition by blinking of the Burner Status indicators.

To recover from an overheat condition, proceed as outlined below:

STEP1: Turn OFF Heater

STEP2: Allow Monitor Heater to cool

NOTE: Be sure that heater is cool to touch.

A period of 30 to 45-minutes should be sufficient to permit heater to cool completely.

STEP3: Unplug Heater
Disconnect heater power cord from wall outlet.

STEP4: Check for Cause of Overheating

NOTE: Overheating is usually caused by objects that impede free air circulation.

Look for debris and other obstructions at front of heater, at Circulation Fan at rear of the heater, and at Flue Pipe tip outside dwelling.

STEP5: Remove Louver Assembly

STEP6: Clean Heater Interior

WARNING:

BEFORE PROCEEDING TO CLEAN HEATER, BE SURE THAT HEATER INTERIOR IS COOL ENOUGH TO TOUCH.

With a clean, lint-free, damp rag or other appropriate cleaning material, wipe up all dust, dirt and debris from exterior of cabinet, including exterior of Combustion Chamber and Heat Exchanger.

STEP7: Replace Louver Assembly

STEP8: Reconnect Monitor Heater Power Plug to the Wall Outlet.

STEP9: Turn Heater ON

STEP10: Reprogram Heater Microprocessor

STEP11: Select Mode of Operation

CAUTION: If after the completion of recovery procedure, the heater overheats again, something is wrong !

Do not operate heater until problem has been diagnosed and corrected.

3-14 RECOVERY FROM BLOWN FUSE

All electrical components of the Monitor heater are protected against power overloads and electrical malfunctions by two 2-amp fuses and a 10-amp fuse. Should fuse blow, the recovery procedure is outlined below:

STEP1: Turn Monitor OFF

STEP2: Unplug heater

STEP3: Remove louver assembly

STEP4: Remove front cover

NOTE: As the Frc ɔver of the Monitor 41 is connected ⁻ ːe Printed Circuit Board by Lead Wires, pull the Front Cover to the front side slightly and remove the Connector of the Lead Wires from the Printed Circuit Board, and then, remove the Front Cover.

STEP5: Locate and replace fuse(s)

STEP6: Reattach front cover
(In case of the Monitor 41, be sure that the connector is connected to the printed circuit board.)

STEP7: Reattach louver assembly

STEP8: Plug heater power cord into wall outlet

STEP9: Turn Monitor ON

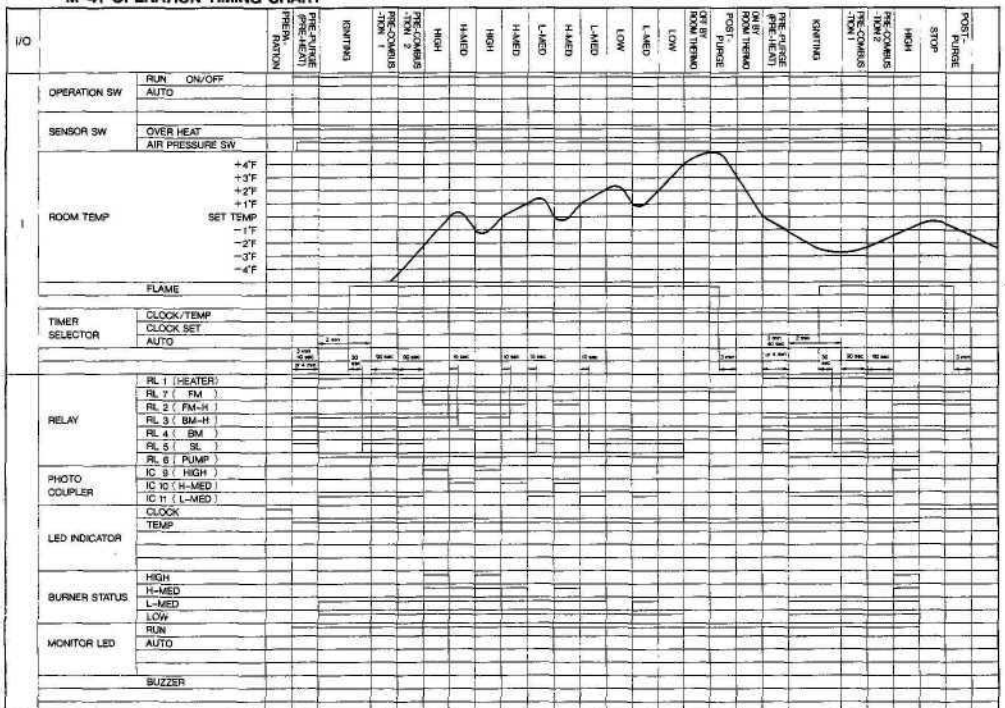
STEP10: Reprogram heater

STEP11: Program Automatic operation cycles (if applicable)

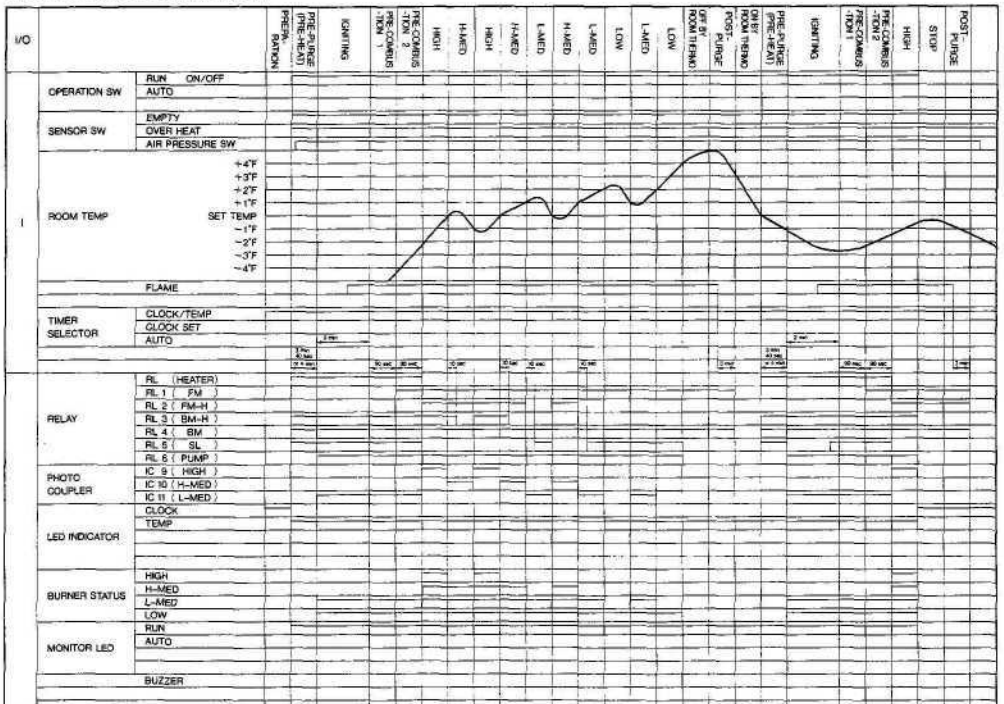
STEP12: Select Automatic operation (if applicable)

3-15 OPERATION CONTROL SYSTEM

M-41 OPERATION TIMING CHART



M-22 OPERATION TIMING CHART



4-1 INTRODUCTION

Heater maintenance is divided into two classifications; periodic maintenance is required to maintain the heater in good operating condition; corrective maintenance is necessary to repair a malfunction.

4-2 PERIODIC MAINTENANCE

The Maintenance Schedule provided in Table 4-1 describes the tasks that must be performed periodically in order to sustain the efficiency of the Monitor Heating Systems.

At the time of the demonstration or installation, heater maintenance should be discussed with the user; emphasize that a clean heater and proper fuel are the keys to optimum heater operation and performance.

Table 4-1 SUGGESTED MAINTENANCE ACTIVITIES

Activity	Material	Remarks
Check all fuel lines for leaks and loose connections	3 8" OD copper tubing	Fuel lines must be secure and free of leaks, Replace tubing when necessary.
Inspect exhaust lines for leaks or loose connections		All exhaust lines must be covered by a cloth insulation cover.
Check fuel for water and or other contamination. If the capsule tank is used on the Monitor 22 the capsule tank filter should be checked, cleaned or replaced.		Fuel color should be crystal clear. if fuel is contaminated, see Corrective Maintenance procedure, paragraph 4-9,
Inspect Fuel Pipe for obstruction		
Inspect electrical wiring for cracks, signs of deterioration, bare wires and or loose connectors		**WARNING:** **UNPLUG HEATER BEFORE PROCEEDING. HEATER MUST ALSO BE COOL BEFORE STARTING.**
Clean heater	Clean, lint-free cloth and a mild non-abrasive household cleaning agent. USE ONLY NON-PETROLEUM DISTILLATE CLEANERS.	Wipe down exterior of heater cabinet. Vacuum heater interior (if necessary).
Clean Air Circulation Fan (Monthly)		Vacuum fan cage. Wipe fan blades.
Inspect air lines for leaks or loose connections. Inspect rubber Air Hose at rear of heater.		Look for cracks, wear, or signs of deterioration; replace if necessary.
Clean fuel constant level Valve filter. Inspect fusible link Valve input fitting. Clean only if necessary, Varify that heater is level.	Clean Kerosene	Refer to paragraph 4-5. Procedure is described in paragraph 4-6. Check Leveling Guide.

Activity	Material	Remarks
Inspect Combustion Ring, Flame Sensor Rod and Baffle. (Suggested frequency every 3 years).		Clean all carbon deposits. Replace if excessively worn or cracked. **NOTE:** If any gaskets are torn when Components are removed, the gasket must be replaced.
Clean Combustion Chamber (every 3 years)		Vacuum all carbon deposits from interior of chamber.
Inspect air holes in Burner Pot		Use a small, stiff brush or a short length of soft copper wire to clean any blocked holes.
Clean Igniter		Scrape any carbon deposits from igniter.
Check air line that interconnect Combustion Blower and Air Pressure Switch.		Replace air line that is worn, broken or brittle.
Check for carbon build up in fuel inlet going into burn chamber (every year) **CAUTION: If any obstruction is felt remove igniter before proceeding.**		Disconnect copper fuel line from burn chamber and clear fuel inlet line by reaming with a solid piece of wire(such as copper,bailing wire,or coat hanger) which should be able to go in approximately 3" without obstruction. **NOTE:** *Removing and retightening* burner fuel connection must be done when the burner cools down completely. If it is done when the burner is hot, the welding on the fuel joint may break. Fixing torgue for nut:30~40kg·cm(26~35lb·in)

4-3 INSPECT EXHAUST AIR LINES

Verify that all exhaust and air lines are free of leaks and loose connections, as specified below:

STEP1: Remove Protective Cloth

Remove cloth insulation cover(s) from all exhaust lines.

STEP2: Inspection of Exhaust Air Lines

A. Visually inspect both air and exhaust lines for obvious cracks, leaks or loose connections. Black carbon deposits may be evidence of these leaks.
B. Be sure that all lines are installed tightly and securely, especially at joints.
C. Turn heater ON.
D. Carefully apply a small amount of soapy water (with a paint brush) to the surface areas of the air exhaust lines.

Any leaks that may exist will be readily identified by the appearance of bubbles.

STEP3: Return to Operating Condition

A. Turn heater OFF.
B. Dry all lines with paper towels.
C. Repair any leaks that have been found (if necessary, replace the tubing).
D. Replace cloth insulation covers.

4-4 VERIFY IGNITER OPERATION
Visually inspect Igniter Operation

WARNING:

HEATER IS OPERATIONAL DURING THIS INSPECTION. AVOID DIRECT CONTACT WITH ANY HEATED OR ELECTRICAL COMPONENT.

STEP1: Prepare for Inspection
Remove Louver Assembly.

STEP2: Visual Inspection
A. Turn heater ON.
B. Look (downward) through window on the Combustion Chamber. Verity that igniter is glowing.

If igniter does not glow, something is wrong. Refer to the Troubleshooting Chart in Section 6 of this Service Manual to diagnose the problem.

CAUTION: If igniter is broken,do not operate the "ON OFF" switch button repeatedly.

STEP3: Reassembly of Heater
Turn the heater OFF and replace the Louver Assembly.

4-5 CLEAN FUEL CONSTANT LEVEL VALVE FILTER
Contaminants are trapped by the filter to prevent them from clogging the Fuel Constant Level Valve.

The filter, itself has a great number of small pores. Whenever a filter is torn or disfigured (enlarged pores), it should immediately be replaced.

Inspect and clean the filter as indicated by the procedure below:

WARNING

CLOSE FUSIBLE LINK VALVE ON M-22 OR CLOSE SHUT-OFF VALVE OF THE EXTERNAL FUEL TANK ON M-41 TO AVOID DRAINING ALL FUEL FROM TANKS.

NOTE: Power should be OFF during the performance of this procedure.

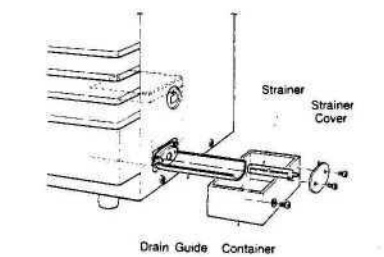
STEP1: Disassembly
A. Using a phillips head screwdriver, unscrew the screws holding the rounded diamond-shaped cover plate at the bottom of the Fuel Constant Level Valve. Remove the cover plate.

NOTE: Position a six inch U shaped piece of metal or cardboard under strainer cover to drain fuel into a pan.

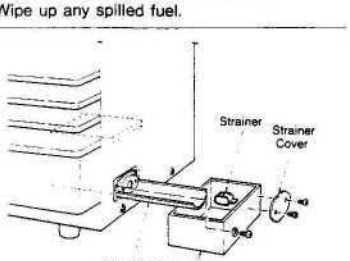
B. Carefully remove the rubber gasket which is located behind the cover plate.

STEP2: Inspection and Cleaning
A. Pull the filter straight out of the fuel reservoir.
B. If the filter is dirty (but undamaged), rinse the filter in fresh, clean kerosene to remove all particles. Replace damaged filters.
C. To drain off upper portion of fuel constant level valve, back out phillips head screw which is located slightly above and to the left of filter cover plate. (See Fig4-1)

STEP3: Reassembly
A. Push the (new or cleaned) filter back into the bottom of the fuel reservoir.
B. Replace both the rubber gasket and the cover plate. (Take care to properly align the screw holes in the gasket and cover plate).
C. Wipe up any spilled fuel.



M-41



M-22

Figure 4-1 CLEAN FUEL CONSTANT LEVEL VALVE

4-6 CLEANING FUSIBLE LINK VALVE INTAKE FITTING ON M-22

At periodic intervals, the fitting on the Fusible Link Valve should be cleaned to prevent any accumulation of foreign materials from clogging the inlet. This is accomplished as follows:

WARNING

UNPLUG THE HEATER. POWER TO THE HEATER SHOULD BE OFF DURING THE PERFORMANCE OF THIS PROCEDURE.

STEP1: Close off Fuel Supply

A. Shut off fuel at the Storage Tank or remove fuel from the fuel sump tank with siphon and syringe if using the capsule fuel tank.

B. Manually turn handle to close Fusible Link Valve.

NOTE: Place paper towels underneath the Fusible Link Valve to catch any spilled fuel.

STEP2: Clean Valve

A. Loosen hex nut on Fusible Link Valve inlet fitting at rean of the heater. Disconnect the copper tubing which delivers the fuel from the storage or the fuel sump tank.

B. Using a small, straight piece of wire carefully and slowly ream-out the inlet fitting on the Fusible Link Valve.

Avoid scratching the inside wall of the fitting.

With a cotton swab, wipe the interior area of the inlet fitting.

STEP3: Reconnect Fuel Line

A. Reconnect the copper tubing to the intake fitting and tighten the hex nut.

B. Turn ON fuel at Fusible Link Valve and at storage tank or fuel sump tank.

C. Check for leaks.

4-7 CORRECTIVE MAINTENANCE

The two procedures below are remedies for very generalized types of operating difficulties.

4-8 REPLACEMENT OF FUSES

A short circuit or similar electrical malfunction could cause the fuse to blow. Troubleshoot the cause of the blown fuse.

Replace the fuse as follows:

WARNING

DO NOT REPLACE FUSE WHILE POWER IS ON.

STEP1: Removal of Fuse

A. Unplug heater. Remove Louver Assembly and Front Cover.

B. Remove the fuse from fuseholder on the Printed Circuit Board.

STEP2: Installation of New Fuse

A. Install a new fuse into the fuseholder. The fuse must be a 250-V, 2 amp or a 250-V, 10 amp type as marked on the printed circuit board.

B. Replace the Front Cover and the Louver Assembly and plug the heater into the wall outlet.

IMPORTRNT: Whenever the heater is unplugged, the Microprocessor must be reprogrammed when power is restored.

4-9 FUEL CONTAMINATION

Fuel contamination is often difficult to diagnose, even though it will adversely affect heater operation and performance. The best course of action to take when fuel contamination is suspected is to examine all of the system's fuel filters, beginning with the fuel storage tank. If a Monitor Kerosene Lifter is part of the fueling system, examine and clean that unit's filter, as well as the filter located in the Fuel Constant Level Valve. When it has been determined that water or some other contaminants have infiltrated the fuel, the following action must be taken:

WARNING

BEFORE PROCEEDING FURTHER, UNPLUG THE HEATER.

STEP1: Remove Contamination

A. Shut OFF the fuel supply at the storage tank or at the Fusible Link Valve.

B. Drain off the contaminants from the fuel storage tank or the fuel sump tank (M-22). Fill with fresh, clean fuel.

STEP2: Clean the Heater

A. Clean fuel constant level valve filter and filter compartment.

B. Remove the Louver Assembly and Solenoid Pump on the constant level valve. Clean the Solenoid Pump filter.

STEP3: Reinstall Cleaned Components

A. Replace the components correctly and install new gasket.

B. Turn on the fuel at the storage tank and at the fusible link valve, and apply power to the heater.

If problem still exists and contaminated fuel is suspected it can be checked by

A. Shutting off the fuel supply at the storage tank and at the fusible link valve.

B. Drain off fuel at constant level valve.

C. Disconnect fuel line at back of heater and hook up a 5 gallon quick tank with proven good fuel.

D. Test run heater to see if problem clears up with use of new fuel.

5-1 INTRODUCTION

Servicing is required when the Monitor Heater is not running at proper efficiency. This section covers possible causes and corrective procedures for efficiency loses.

Signs of improper heater efficiency and performance would be:

- Yellowish lazy flame
- Smoke from flue pipe exhaust
- Heavy soot and carbon build up in combustion chamber
- Lowered heat output.

5-2 MEASUREMENT OF FUEL FLOW RATE

Fuel flow rates are preset and sealed. These rates should not and we recommend they do not be readjusted.

5-3 REMOVAL OF WATER DEPOSITS AND CONTAMINANTS FROM FUEL CONSTANT LEVEL VALVE AND FUEL LINES

NOTE: Disconnect the Monitor from power supply (unplug) before proceeding.

1. Use a syphon pump and a syringe to drain off any fuel in the fuel sump (in case of capsule tank use on the Monitor 22).
2. If using separate tank on the Monitor 22, shut off fusible link valve. On the Monitor 41 shut off valve of separate tank.
3. Bend a piece of sheet metal or cardboard into a U shape and place it under the fuel constant level valve strainer cover to drain bad fuel into a 1-2 liter pan. (Figure 4-1)
   A. Remove strainer cover and drain.
   B. With strainer cover removed, inspect, clean and or replace strainer if damaged.
   C. Remove drain port screw and drain.
   D. Replace strainer, cover and screw.
   E. Open fusible link valve or shut-off valve to refill system with fresh crystal clear kerosene.
   F. Repeat steps 1-3 until all contaminated fuel is drained off.
4. Remove fuel feed pipe from burner pot and solenoid pump, and drain fuel into pan.
5. Once lines are clear, reconnect fuel feed pipe, turn operation switch ON and start a test run.

NOTE: Removing and retightening burner fuel connection must be done when a burner cools down completely. If it is done when a burner is hot. the welding on the fuel joint may break. Fixing Torgue for nut:30 ~40kg · cm(26~35ls.in).

5-4 CLEANING THE BURN CHAMBER & BURNER POT

Under normal running conditions, soot will not deposit in great quantities in side the burner, and a light covering of soot will not affect the performance of the unit thus it need not be cleaned. However, if heavy soot built up does occur the unit should be opened and cleaned.

The burner is assembled using gaskets to maintain its air tightness. If these gaskets leak, the extra air can cause a serious soot problem and or exhaust gases to escape into the area being heated.

NOTE: If any gaskets are torn when components are removed.

If cleaning is necessary, use the following method:

1. On the Monitor 22
   A. Remove louver assembly.
   B. Remove front cover.
   C. Remove top cover and lead wire connectors.
   D. Remove front bracket and top bracket to cover combustion chamber.
   E. Remove combustion chamber cap.
   F. Remove service panel.
   G. Remove baffle from within combustion chamber.
   H. Remove flame detector rod.
   I. Remove burner cap.
2. On the Monitor 41
   A. Remove louver assembly.
   B. Remove front cover and lead wire connectors.
   C. Remove top cover.
   D. Remove front bracket to cover combustion chamber.
   E. Remove service panel and chamber cap.
   F. Remove Flame detector rod.
3. Turn counter-clockwise to remove combustion ring.
4. Use wire brush to clean inside of combustion chamber.
   Vacuum and wipe clean with a waste cloth.
5. If tar is present on the burner bottom, remove the tar by using a flat-bladed screw driver or wire brush,then clean the area by using a vacuum cleaner etc.

NOTE: Make sure all air inlet openings are clear.

6. When cleaning the inside of the burner pot, remove the igniter and change the burner cloth by the following procebure.

7. On the Monitor 22
   A. Apply glue(P №8217) on the burner bottom as shown in Figure5-1.

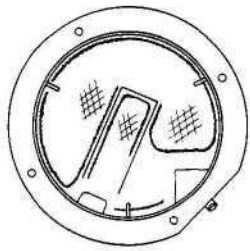


Figure 5-1

   B. Put the burner cloth on the burner bottom, afterwards press and straighten out the burner cloth so that it is glued flat and even on the burner bottom.

8. On the Monitor 41
   A. Apply glue arround the burner cloth as shown in Figure 5-2.

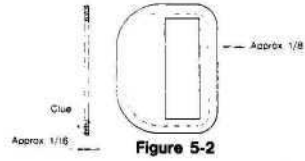


Figure 5-2

   B. As shown in Figure 5-3 and 5-4, insert the Burner Cloth narrow between the Nozzle Collar and the Igniter Shield, then push the Burner Cloth, using your fingers or a screw driver, so that it slips in under the Nozzle Collar. Afrerwards press and straighten out the Burner cloth so that it is glued flat and even on the Burner bottom.

NOTE: In some cases, pulling out the Fuel Nozzle and Collar may make this procedure easier.

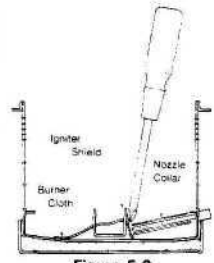


Figure 5-3

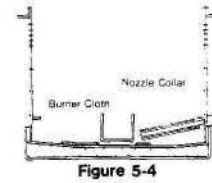


Figure 5-4

   C. Apply glue at all 4 corners of Burner Cloth as Shown in Figure 5-5.

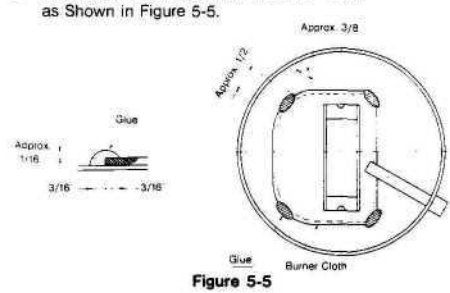


Figure 5-5

NOTE: The Burner Cloth is not symmetrical in shape, therefore make sure to place it in the correct position so that the wider side of the cloth is at left side of the Igniter Shield as shown in Figure 5-5.

9. Combustion ring may deform and deteriorate after several years use and should be cleaned and inspected before reinstallation. If combustion ring is warped, has cracked or is deteriorating excessively it should be replaced.
10. When reassembling the unit check that combustion ring is positioned whit the correct side up and is sitting squarely on all three support screws(M-22) or pins(M-41) inside the burner pot.
11. Reassemble by reversing the procedure followed during disassembly.

NOTE: Make sure the position of flame detector rod is centered between combustion ring and burner pot before reassembling chamber cap.(See Figure 5-6)

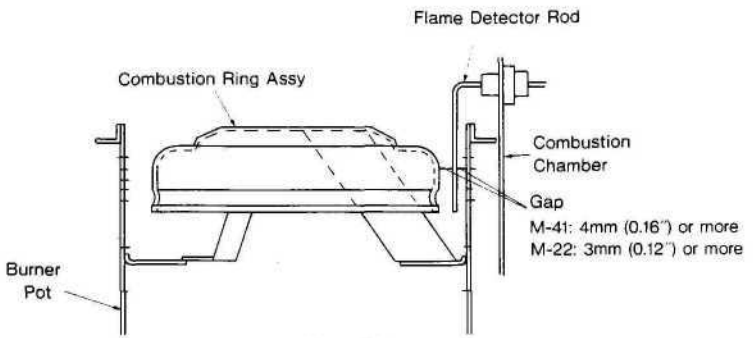


Figure 5-6

5-5 CLEANING THE FUEL INLET

When cleaning the combustion chamber and the burner pot, the fuel inlet nozzle should also be cleaned. This can be done as follows:

1. Disconnect copper fuel line at burn chamber.
2. Push a piece of wire (about the same size as the I.D. of fuel inlet pipe) into the fuel inlet nozzle.
3. If obstruction is felt twist wire back and forth (to brake up soot and carbon) so that wire ultimately penetrates igniter shield.

Monitor 22/41 Resistance values

COMPONENT	APPROX. OHMS M-22	M-41
Igniter (connector B B)	16.8	12.7
Power Transformer – Primary (connector H H)	97	97
Power Transformer – Secondary (connector L L)	824	824
Power Transformer – Secondary (connector M M)	1.3	1.3
Damper Solenoid (connector I I)	4,600	4,600
Resistor (connector G G)	68	91
Circulation Fan (M-41:WH & BK, M-22:RD & BK)	310	120
Circulation Fan (M-41:WH & GR, M-22:RD & YL)	365	190
Circulation Fan (M-41:BL & BK, M-22:GR & BK)	270	260
Circulation Fan (M-41:BL & GR, M-22:GR & YL)	210	200
Combustion Blower (M-41:WH & GR, M-22:BK & BK)	22	78
Combustion Blower (M-41:GR & OR)	—	92
Thermistor (connector Q Q, at 77 F)	10,000	10,000
Fuse 2A (read with fuse out)	0.1	0.1
Fuse 10A (read with fuse out)	0.01	0.01
Solenoid Pump (coil)	688	695

WARNING:

DISCONNECT HEATER FROM POWER SOURCE *BEFORE MAKING ANY RESISTANCE TESTS.*

Monitor 22/41 Component Voltage Readings

COMPONENT	READING TAKEN AT	AC	DC
Thermistor	Q on PCB Sensor disconnected		5
Thermistor	Q on PCB Sensor connected		1.6-3.3
Air Pressure Switch Overheat Protector Closed	Connector J	110	
Air Pressure Switch Overheat Protector Open	Connector J	0	
Damper Solenoid	I on PCB		105
Solenoid Pump	K on PCB		105
Circulation Fan High Speed	GR to BK BK to RD (M-21) BL to BK BK to WH (M-40)	110 110	
Circulation Fan Low Speed	YL to RD GR to YL (M-21) GR to WH BL to GR (M-40)	110 110	
Igniter	B on PCB	110	
Power Transformer (primary side)	H on PCB	110	
Power Transformer (secondary side)	Connector L Connector M	120	 11
Combustion Blower High Speed	F on PCB	110	
Combustion Blower Low Speed	F on PCB (RL3 is OFF)	92(M-22) 88(M-41)	
Resistor	G on PCB	18(M-22) 22(M-41)	

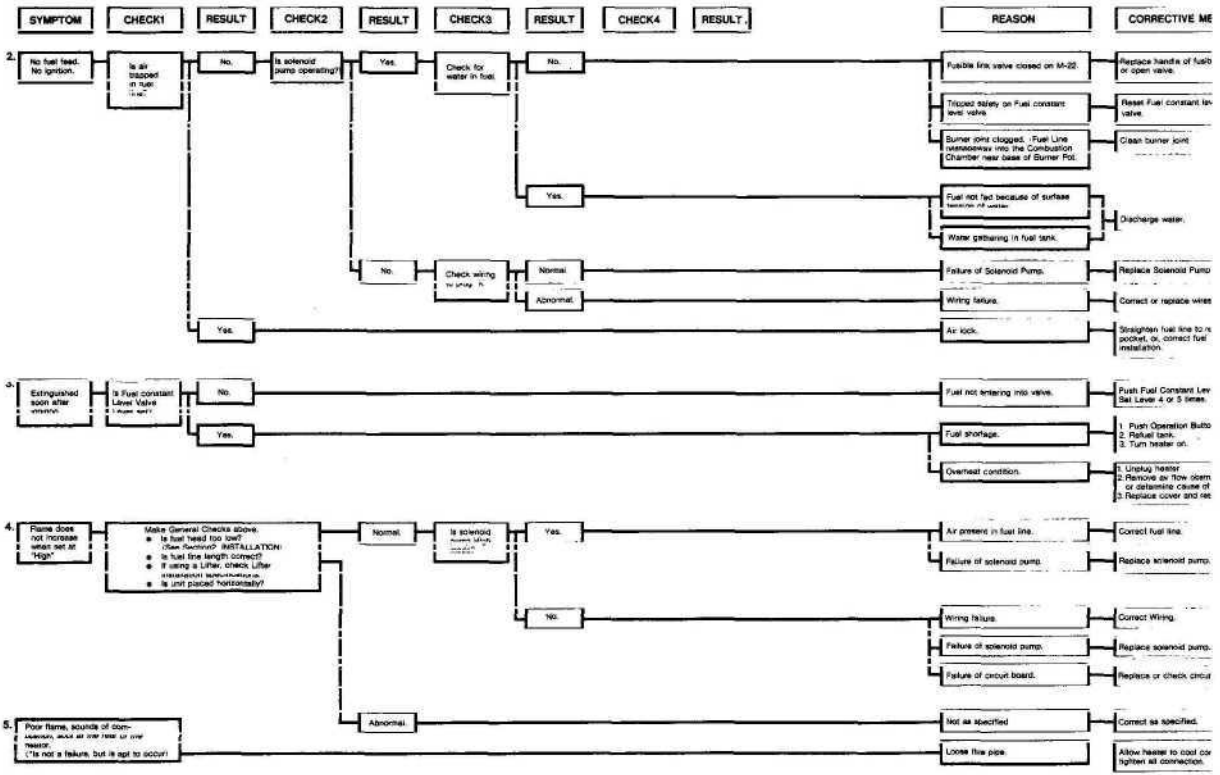
TEST POINT VOLTAGE

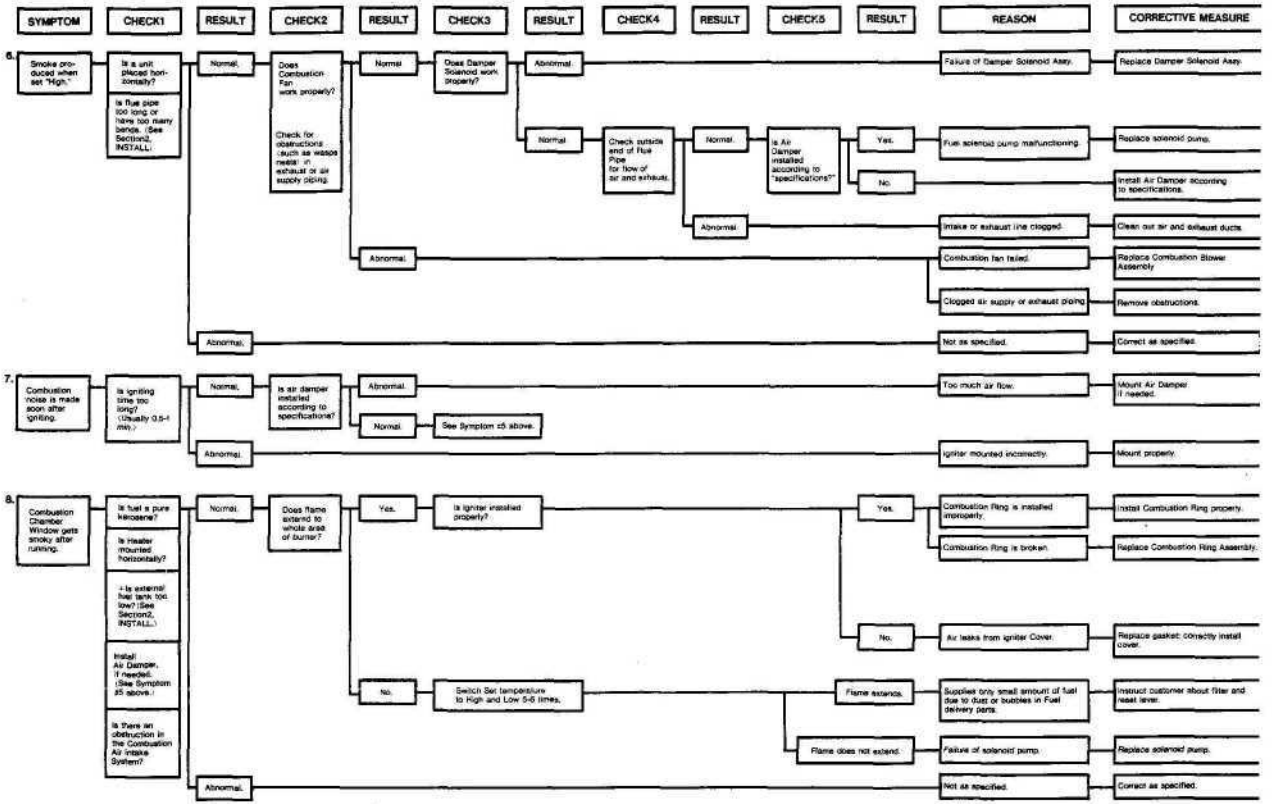
Operation Mode / Test Point	Preparation	Pre-purge Pre-heat	Igniting low med 2 min.	Pre-burning 1 1.5 min. (C.F.M:Off)	Pre-burning 2 1.5 min. (C.F.M:Low)
TP 3	12V ± 30%	12V ± 30%	12V ± 30%	12V ± 30%	12V ± 30%
TP 4	5V ± 10%	5V ± 10%	5V ± 10%	5V ± 10%	5V ± 10%
TP 5	3.9V	3.9V	3.9V	3.9V	3.9V
TP 6	pulse	pulse	pulse	pulse	pulse
TP 7	OV	OV	infinitly variable	1.2V min.	1.2V min.
TP 8	pulse at plugin	5V	5V	5V	5V

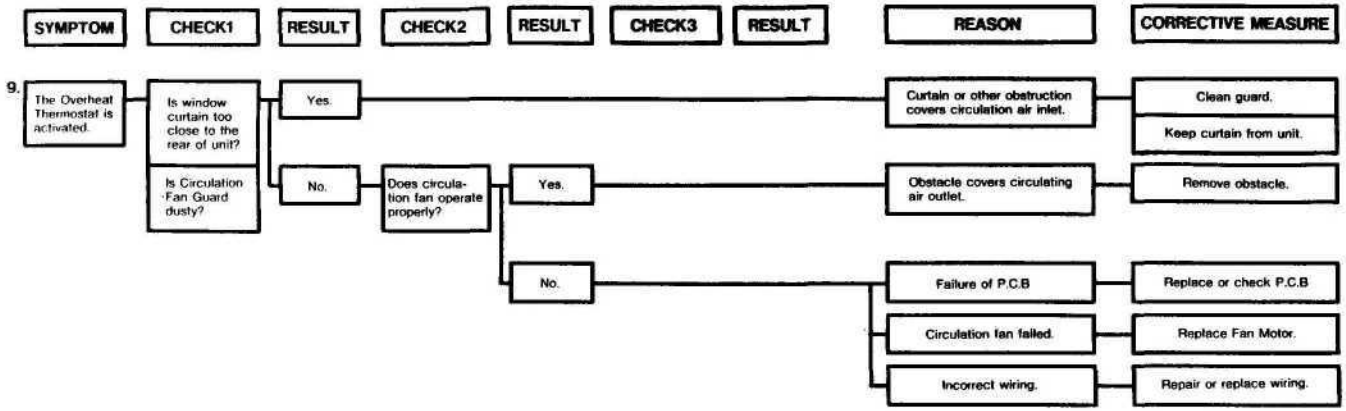
Operation Mode / Test point	High	Medium-High	Medium-Low	Low	OFF	Post-purge	Waiting until programmed time comes on
TP 3	12V ± 30%	12V ± 30%	12V ± 30%	12V ± 30%	12V ± 30%	12V ± 30%	12V ± 30%
TP 4	5V ± 10%	5V ± 10%	5V ± 10%	5V ± 10%	5V ± 10%	5V ± 10%	5V ± 10%
TP 5	3.9V	3.9V	3.9V	3.9V	3.9V	3.9V	3.9V
TP 6	pulse	pulse	pulse	pulse	pulse	pulse	pulse
TP 7	1.2V min.	1.2V min.	1.2V min.	1.2V min.	OV	infinitly variable	OV
TP 8	5V	5V	5V	5V	5V	5V	5V

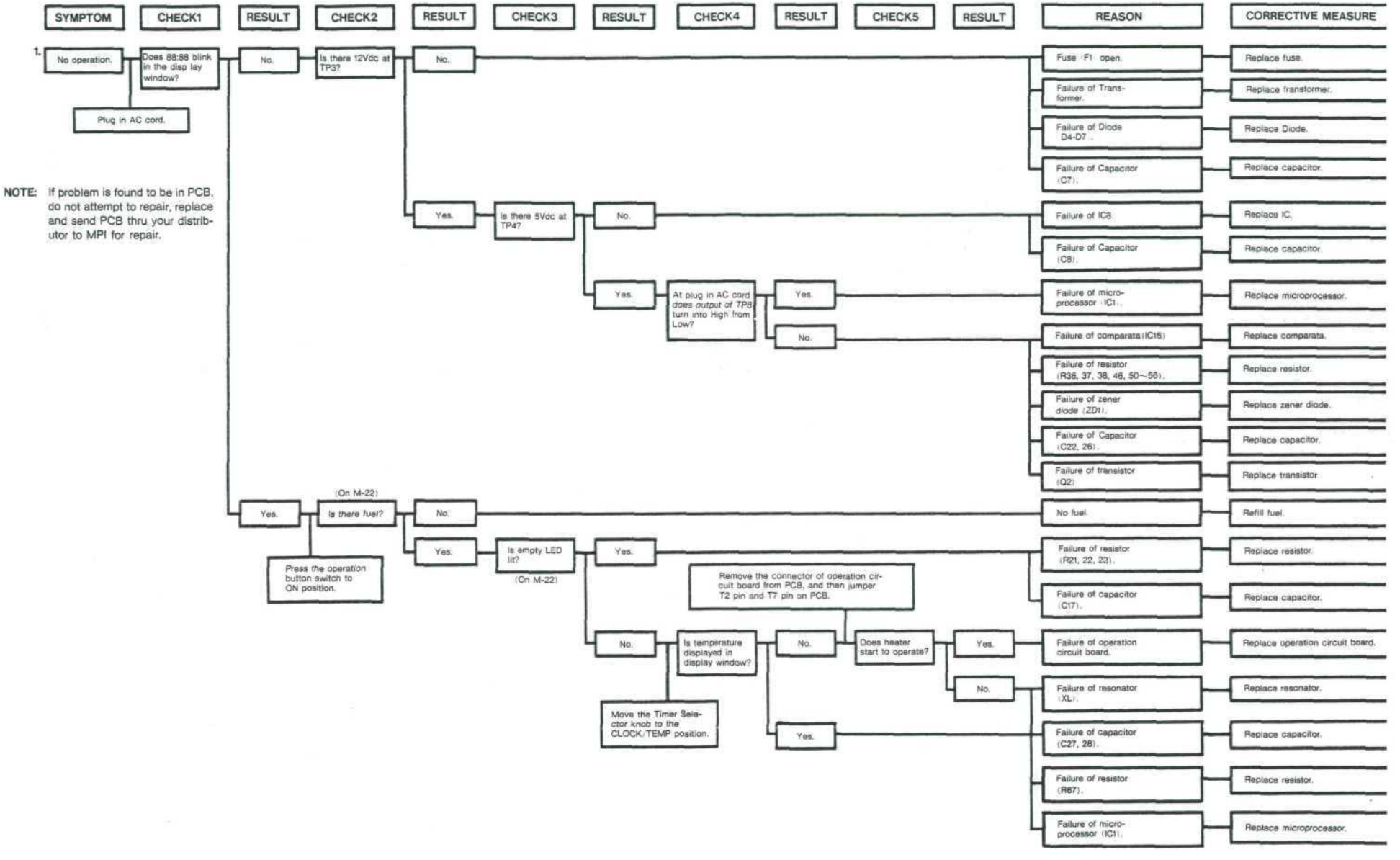
GENERAL CHECKS
Is power available in wall outlet?
Is power Plug inserted in wall outlet?
Has there been a power interruption? (Display window shows 88:88)
Has Circulation Fan stopped?
Is fuel in tank? Tank valve open?
Has Fuel Constant Level Valve Set Lever raised and lowered?
Is Operation Switch on?
Is operation mode on Manual?
Is set temperature in High position?
Is Fusible Link Valve "open"?

	SYMPTOM	CHECK1	RESULT	CHECK2	RESULT	CHECK3	RESULT	CHECK4	RESULT	CHECK5	RESULT	REASON	CORRECTIVE MEASURE
1.	No ignition	Operation lamp lit?	Yes.	Is Igniter red? Check visually through the Combustion Chamber viewing window, of fuel igniter cover (after 3-5 minutes preparge preheat. It should be warm to the touch.	Yes.	Is there flame?	Yes.					Failure of Circuit Board	Replace or check Circuit Board.
												Incorrect wiring of Flame sensor or Ground.	Correct wiring.
												Flame sensor rod touches to burner parts.	Correct or Change.
							No.	Does Combustion Blower motor operate?	Yes.			Failure of Air Pressure Switch.	Replace Air Pressure Switch.
												Failure of Solenoid Pump.	Replace Solenoid Pump.
												Has constant level valve safety tripped.	Reset the fuel constant level valve.
									No.	Is wiring correct?	Yes.	Failure of Combustion Blower motor.	Replace Combustion Blower Motor.
												Failure of Circuit Board	Replace or check Circuit Board.
											No.	Incorrect wiring.	Correct wiring.
					No.	Is Igniter red?	Yes.					Soot adhering to combustion chamber interior.	Clean gently with brush, etc.
												Failure of solenoid Pump.	Replace Solenoid Pump.
				1. Operation Switch OFF. 2. Remove igniter. 3. Disconnect wiring for Solenoid Pump.			No.	Is there 110V at "E" pins on circuit board?	Yes.			Failure of igniter.	Replace igniter.
									No.			Failure of Circuit Board.	Replace or check Circuit Board.
												Incorrect wiring.	Correct wiring.
				4. Operation Switch ON.								Is there 110V at plug	Failure of Igniter relay on PCB replace board.
			No.	Is Display Window lit?	No.	Check Fuse (F1).	Normal.					Failure of Circuit Board.	Replace or check Circuit Board.
							Melted.	Change fuse, plug in power cord.	Normal.			Fuse open.	Change fuse.
									Melted.			Short circuit of lead wire.	Correct or change.
					Yes.							Failure of Circuit Board.	Replace or check Circuit Board.
												is in Auto operation mode.	Put in Manual-Burn Mode.

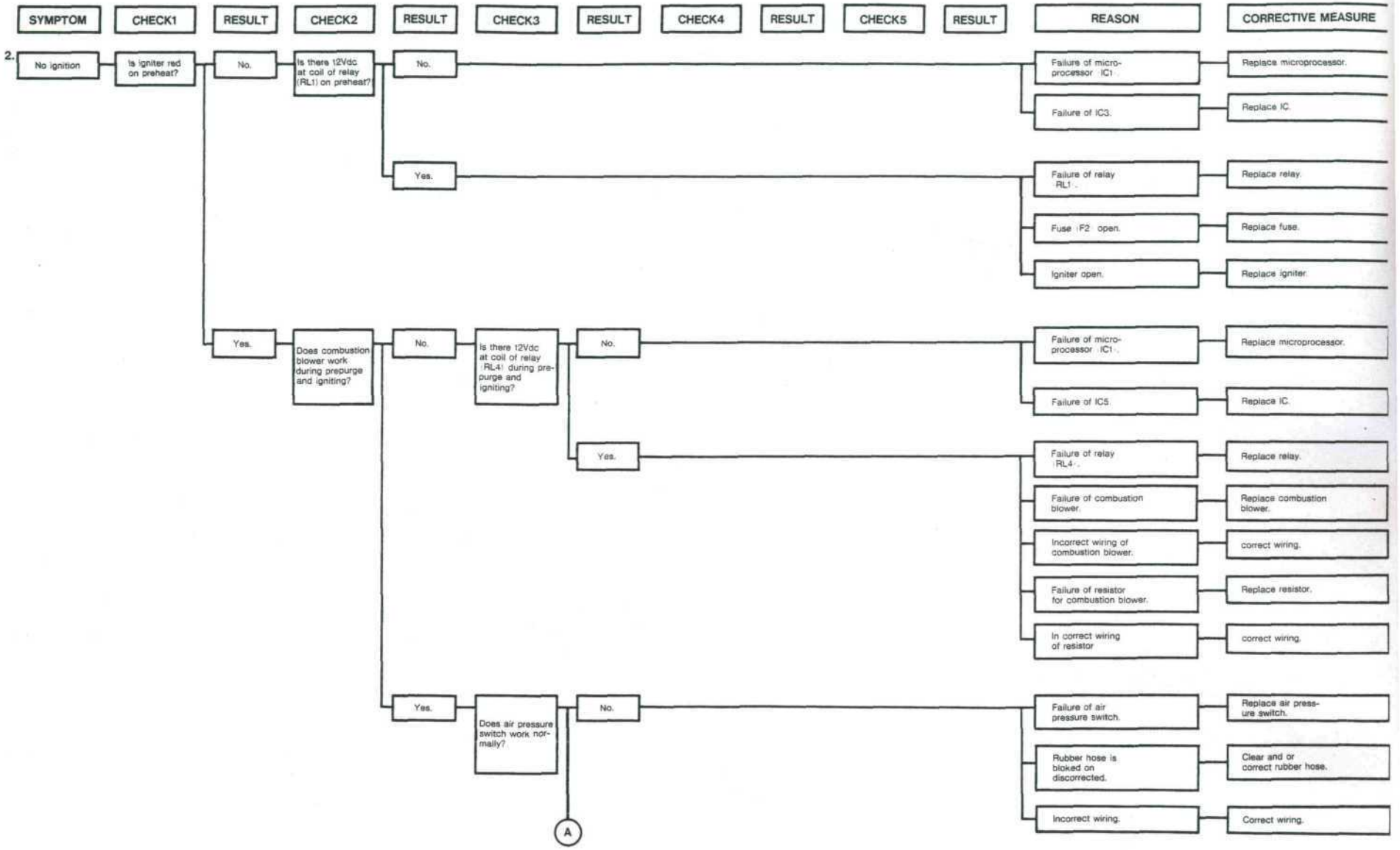

SYMPTOM
CHECK1
RESULT
CHECK2
RESULT
CHECK3
RESULT
CHECK4
RESULT
REASON
CORRECTIVE ME
2.
No fuel feed.
No ignition.
No.
Is solenoid pump operating?
Yes.
Check for water in fuel.
No.
Fusible link valve closed on M-22.
Replace handle of fusib or open valve.
Tripped safety on Fuel constant level valve.
Reset Fuel constant lev valve.
Burner joint clogged. Fuel Line interconnect into the Combustion Chamber near base of Burner Pot.
Clean burner joint
Yes.
Fuel not fed because of surface
Water gathering in fuel tank.
Discharge water.
No.
Check wiring
Normal
Failure of Solenoid Pump.
Replace Solenoid Pump
Abnormal.
Wiring failure.
Correct or replace wires
Yes.
Air lock.
Straighten fuel line to re pocket, or, correct fuel installation.
3.
Extinguished soon after
Is Fuel constant Level Valve
No.
Yes.
Fuel not entering into valve.
Push Fuel Constant Lev Set Lever 4 or 5 times.
Fuel shortage.
1. Push Operation Butto
2. Refuel tank.
3. Turn heater on.
Overheat condition.
1. Unplug heater
2. Remove air flow obstr or determine cause of
3. Replace cover and re
4.
Flame does not increase when set at "High"
Make General Checks above.
Is fuel feed too low?
(See Section2 INSTALLATION)
Is fuel line length correct?
If using a Lifter, check Lifter
Is unit placed horizontally?
Normal
Is solenoid
Yes.
Air present in fuel line.
Correct fuel line.
Failure of solenoid pump.
Replace solenoid pump.
No.
Wiring failure.
Correct Wiring.
Failure of solenoid pump.
Replace solenoid pump.
Failure of circuit board.
Replace or check circui
Abnormal.
5.
Poor flame, sounds of com-
heater.
(*Is not a failure, but is apt to occur)
Not as specified
Correct as specified.
Loose fire pipe.
Allow heater to cool co tighten all connection.

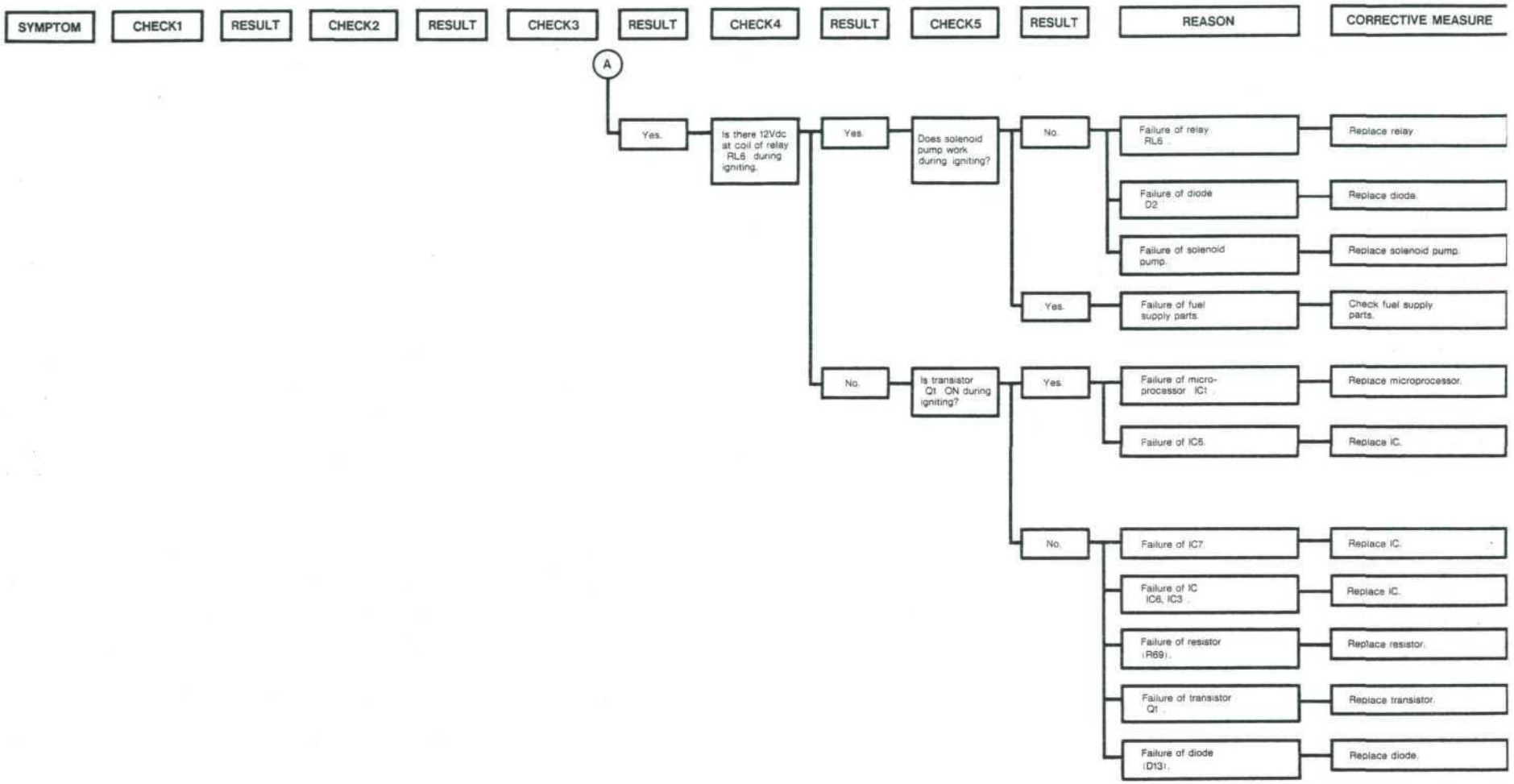

SYMPTOM
CHECK1
RESULT
CHECK2
RESULT
CHECK3
RESULT
CHECK4
RESULT
CHECK5
RESULT
REASON
CORRECTIVE MEASURE
6.
Smoke produced when set "High."
Is a unit placed horizontally?
Is flue pipe too long or have too many bends. (See Section2, INSTALL).
Normal.
Does Combustion Fan work properly?
Check for obstructions (such as waste metal) in exhaust or air supply piping.
Normal.
Does Damper Solenoid work properly?
Abnormal.
Failure of Damper Solenoid Assy.
Replace Damper Solenoid Assy.
Normal.
Check outside end of Flue Pipe for flow of air and exhaust.
Normal.
Is Air Damper installed according to "specifications?"
Yes.
Fuel solenoid pump malfunctioning.
Replace solenoid pump.
No.
Install Air Damper according to specifications.
Abnormal.
Intake or exhaust line clogged.
Clean out air and exhaust ducts.
Abnormal.
Combustion fan failed.
Replace Combustion Blower Assembly.
Clogged air supply or exhaust piping.
Remove obstructions.
Abnormal.
Not as specified.
Correct as specified.
7.
Combustion noise is made soon after igniting.
Is igniting time too long? (Usually 0.5-1 min.)
Normal.
Is air damper installed according to specifications?
Abnormal.
Too much air flow.
Mount Air Damper if needed.
Normal.
See Symptom #5 above.
Abnormal.
Igniter mounted incorrectly.
Mount properly.
8.
Combustion Chamber Window gets smoky after running.
Is fuel a pure kerosene?
Is Heater mounted horizontally?
Is external fuel tank too low? (See Section2, INSTALL.)
Install Air Damper, if needed. (See Symptom #5 above.)
Is there an obstruction in the Combustion Air Intake System?
Normal.
Does flame extend to whole area of burner?
Yes.
Is igniter installed properly?
Yes.
Combustion Ring is installed improperly.
Install Combustion Ring properly.
Combustion Ring is broken.
Replace Combustion Ring Assembly.
No.
Air leaks from igniter Cover.
Replace gasket; correctly install cover.
No.
Switch Set temperature to High and Low 5-6 times.
Flame extends.
Supplies only small amount of fuel due to dust or bubbles in Fuel delivery parts.
Instruct customer about filter and reset lever.
Flame does not extend.
Failure of solenoid pump.
Replace solenoid pump.
Abnormal.
Not as specified.
Correct as specified.


SYMPTOM
CHECK1
RESULT
CHECK2
RESULT
CHECK3
RESULT
REASON
CORRECTIVE MEASURE
9.
The Overheat Thermostat is activated.
Is window curtain too close to the rear of unit?
Is Circulation Fan Guard dusty?
Yes.
No.
Does circulation fan operate properly?
Yes.
No.
Curtain or other obstruction covers circulation air inlet.
Obstacle covers circulating air outlet.
Failure of P.C.B
Circulation fan failed.
Incorrect wiring.
Clean guard.
Keep curtain from unit.
Remove obstacle.
Replace or check P.C.B
Replace Fan Motor.
Repair or replace wiring.



NOTE: If problem is found to be in PCB, do not attempt to repair, replace and send PCB thru your distributor to MPI for repair.


SYMPTOM
CHECK1
RESULT
CHECK2
RESULT
CHECK3
RESULT
CHECK4
RESULT
CHECK5
RESULT
REASON
CORRECTIVE MEASURE
2.
No ignition
Is igniter red on preheat?
No.
Is there 12Vdc at coil of relay (RL1) on preheat?
No.
Failure of micro-processor (IC1).
Replace microprocessor.
Failure of IC3.
Replace IC.
Yes.
Failure of relay (RL1).
Replace relay.
Fuse (F2) open.
Replace fuse.
Igniter open.
Replace igniter.
Yes.
Does combustion blower work during prepurge and igniting?
No.
Is there 12Vdc at coil of relay (RL4) during pre-purge and igniting?
No.
Failure of micro-processor (IC1).
Replace microprocessor.
Failure of IC5.
Replace IC.
Yes.
Failure of relay (RL4).
Replace relay.
Failure of combustion blower.
Replace combustion blower.
Incorrect wiring of combustion blower.
correct wiring.
Failure of resistor for combustion blower.
Replace resistor.
In correct wiring of resistor
correct wiring.
Yes.
Does air pressure switch work normally?
No.
Failure of air pressure switch.
Replace air pressure switch.
Rubber hose is bloked on discorrected.
Clear and or correct rubber hose.
Incorrect wiring.
Correct wiring.
A


SYMPTOM
CHECK1
RESULT
CHECK2
RESULT
CHECK3
RESULT
CHECK4
RESULT
CHECK5
RESULT
REASON
CORRECTIVE MEASURE
A
Yes.
Is there 12Vdc at coil of relay (RL6) during igniting.
Yes.
Does solenoid pump work during igniting?
No.
Failure of relay (RL6).
Replace relay.
Failure of diode (D2).
Replace diode.
Failure of solenoid pump.
Replace solenoid pump.
Yes.
Failure of fuel supply parts.
Check fuel supply parts.
No.
Is transistor (Q1) ON during igniting?
Yes.
Failure of micro-processor (IC1).
Replace microprocessor.
Failure of IC5.
Replace IC.
No.
Failure of IC7.
Replace IC.
Failure of IC (IC6, IC3).
Replace IC.
Failure of resistor (R69).
Replace resistor.
Failure of transistor (Q1).
Replace transistor.
Failure of diode (D13).
Replace diode.

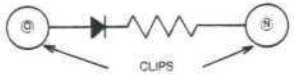
SYMPTOM	CHECK1	RESULT	CHECK2	RESULT	CHECK3	RESULT	CHECK4	RESULT	CHECK5	RESULT	REASON	CORRECTIVE MEASURE
3. Flame failure.	Is there 1.1Vdc at IC2 (⑤ pin)?	No.									Failure of resistor (R5, 6, 7, 8).	Replace resistor.
		Yes.	Is there more than 1.2Vdc at IC2 (⑨ pin)?	No.							Failure of transformer.	Replace transformer.
											Fuse (F3) open.	Replace fuse.
											Failure of capacitor (C13, C14).	Replace capacitor.
											Failure of resistor (R1,11,12,13,24,25).	Replace resistor.
				Yes.	Is there OV at IC2 (④ pin)?	Yes.					Failure of comparator (IC2).	Replace comparator.
						No.					Failure of resistor (R48).	Replace resistor.
											Failure of diode (D17).	Replace diode.
											Failure of capacitor (C30).	Replace capacitor.
											Failure of IC5.	Replace IC.
											Failure of microprocessor.	Replace microprocessor.
											Failure of wiring for flame sensor and ground.	Correct wiring.
											Incorrect installation of flame sensor rod.	Correct installation.

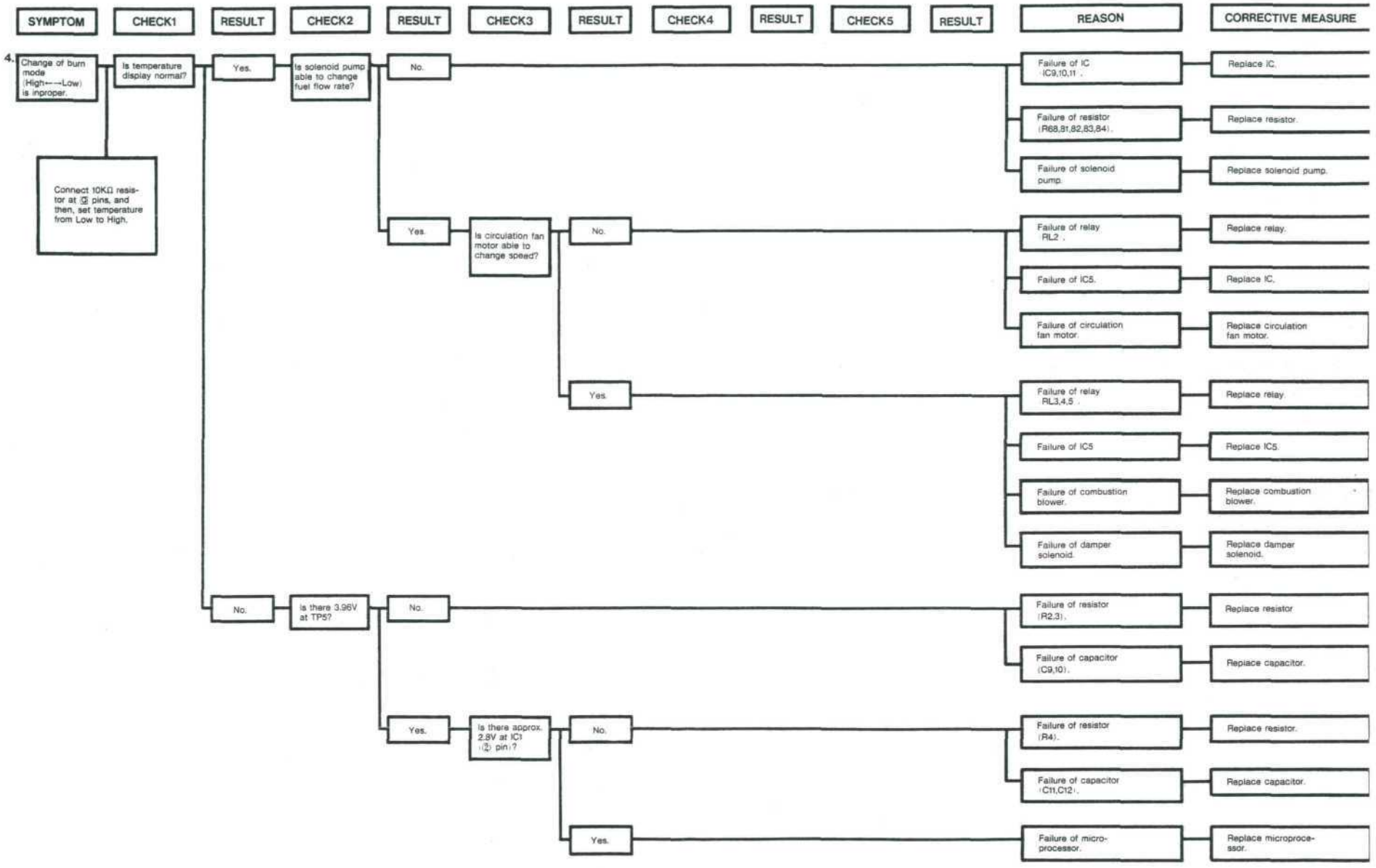
FLAME ROD BYPASS CIRCUIT

For testing purposes - A flame detector rod bypass circuit can be made up, consisting of 2 insulated alligator clips, 2-6" pieces of insulated copper wire, 1-1/4" watt 400 volt diode, and 1-1/4" watt 100k OHM resistor. These components are to be soldered together in sequence as shown in diagram below (note component sequence and polarity).

Once the bypass circuit is made the unit is turned on, immediately after the prepurge preheat cycle; when mode light comes on, the O and N pins are disconnected off the PCB and replaced with the bypass circuit. The unit should then continue functioning as though it had a good flame inside the burn chamber and service tests such as fuel flow can be checked.

(Note - warning after all tests are completed, replace original flame rod wires as it is a vital safety feature.)

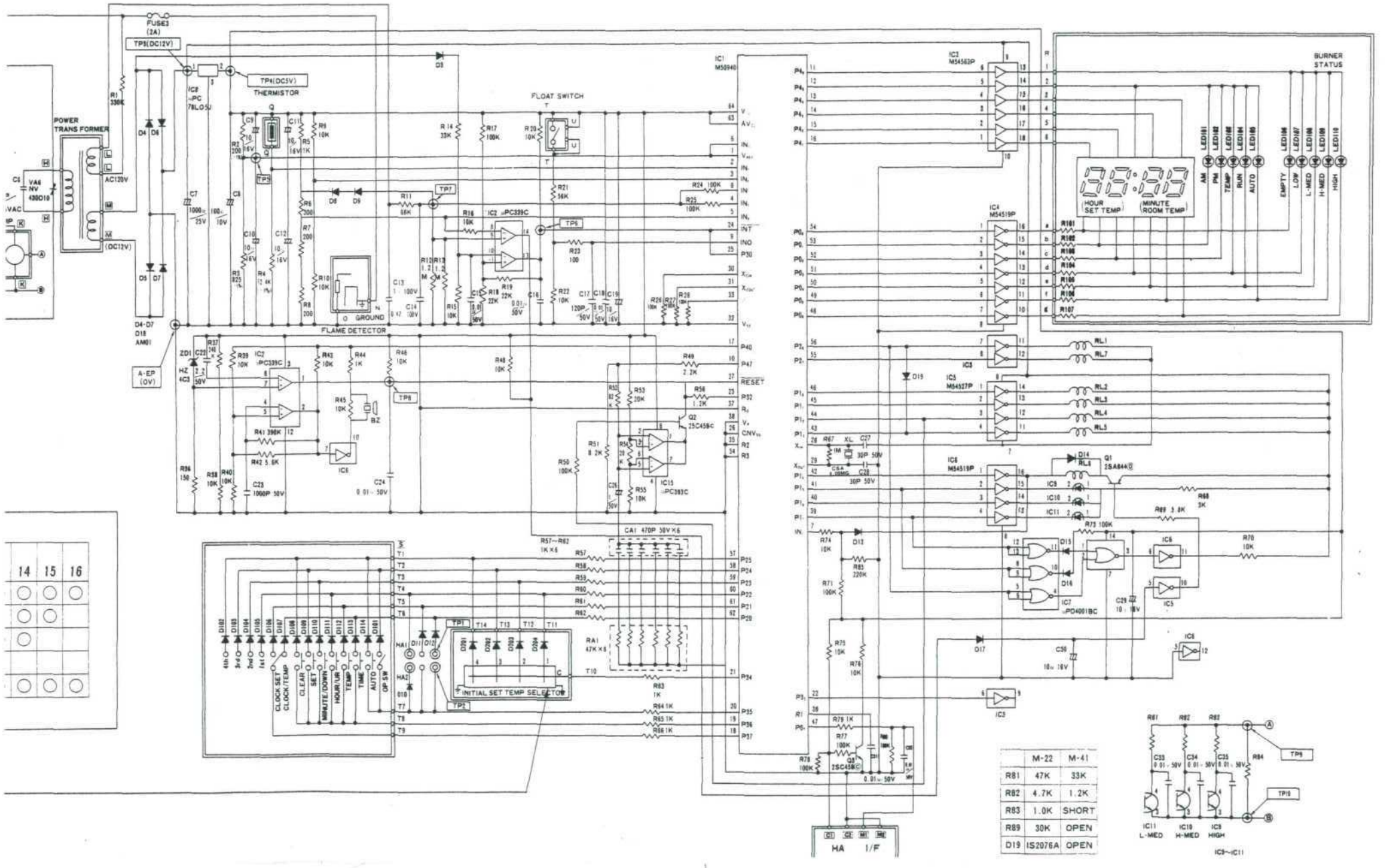



SYMPTOM
CHECK1
RESULT
CHECK2
RESULT
CHECK3
RESULT
CHECK4
RESULT
CHECK5
RESULT
REASON
CORRECTIVE MEASURE
4.
Change of burn mode (High←→Low) is inproper.
Is temperature display normal?
Yes.
Is solenoid pump able to change fuel flow rate?
No.
Failure of IC (IC9,10,11).
Replace IC.
Failure of resistor (R68,81,82,83,84).
Replace resistor.
Failure of solenoid pump.
Replace solenoid pump.
Yes.
Is circulation fan motor able to change speed?
No.
Failure of relay RL2.
Replace relay.
Failure of IC5.
Replace IC.
Failure of circulation fan motor.
Replace circulation fan motor.
Yes.
Failure of relay RL3,4,5.
Replace relay.
Failure of IC5
Replace IC5.
Failure of combustion blower.
Replace combustion blower.
Failure of damper solenoid.
Replace damper solenoid.
Connect 10KΩ resistor at ⑦ pins, and then, set temperature from Low to High.
No.
Is there 3.96V at TP5?
No.
Failure of resistor (R2,3).
Replace resistor
Failure of capacitor (C9,10).
Replace capacitor.
Yes.
Is there approx. 2.8V at IC1 (⑦ pin)?
No.
Failure of resistor (R4).
Replace resistor.
Failure of capacitor (C11,C12).
Replace capacitor.
Yes.
Failure of micro-processor.
Replace microprocessor.

INDICATION OF FAILURE MODE

Digital Display	The Reason of Indication	Trouble Point
E01	At pre-purge, Flame rod is sensing flame when there should be none.	Flame sensing circuit, grounded flame rod or pinched wire.
E05	After power on, power supply to the micro-processer timing circuit is incorrect.	Timer clock circuit bad or power source to unit above or below acceptable levels.
E06	At starting of operation, the circuit to drive Relay RL6 of Solenoid Pump is mal-functioning.	Solenoid Pump control circuit has a malfunction.
E12	When unit is shut off either manually or automatically, flame rod does not detect flame out within 300 seconds.	Driving circuit of RL6 or excess fuel in burner pot.

A
A
POWER
120VAC



	M-22	M-41
R81	47K	33K
R82	4.7K	1.2K
R83	1.0K	SHORT
R89	30K	OPEN
D19	1S2076A	OPEN

CONNECTION OF LEAD WIRES

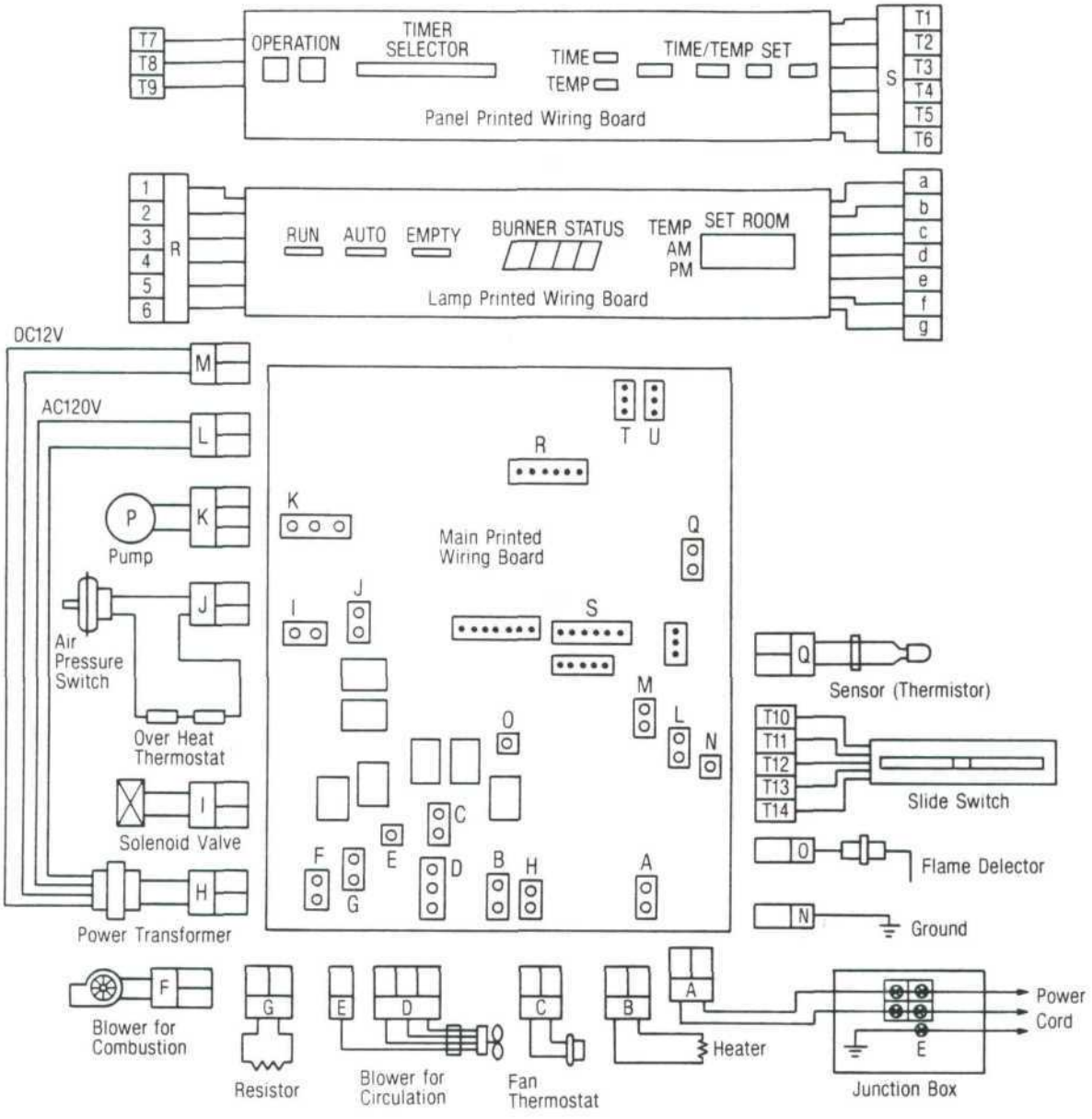


figure 7-1 Monitor 41

CONNECTION OF LEAD WIRES

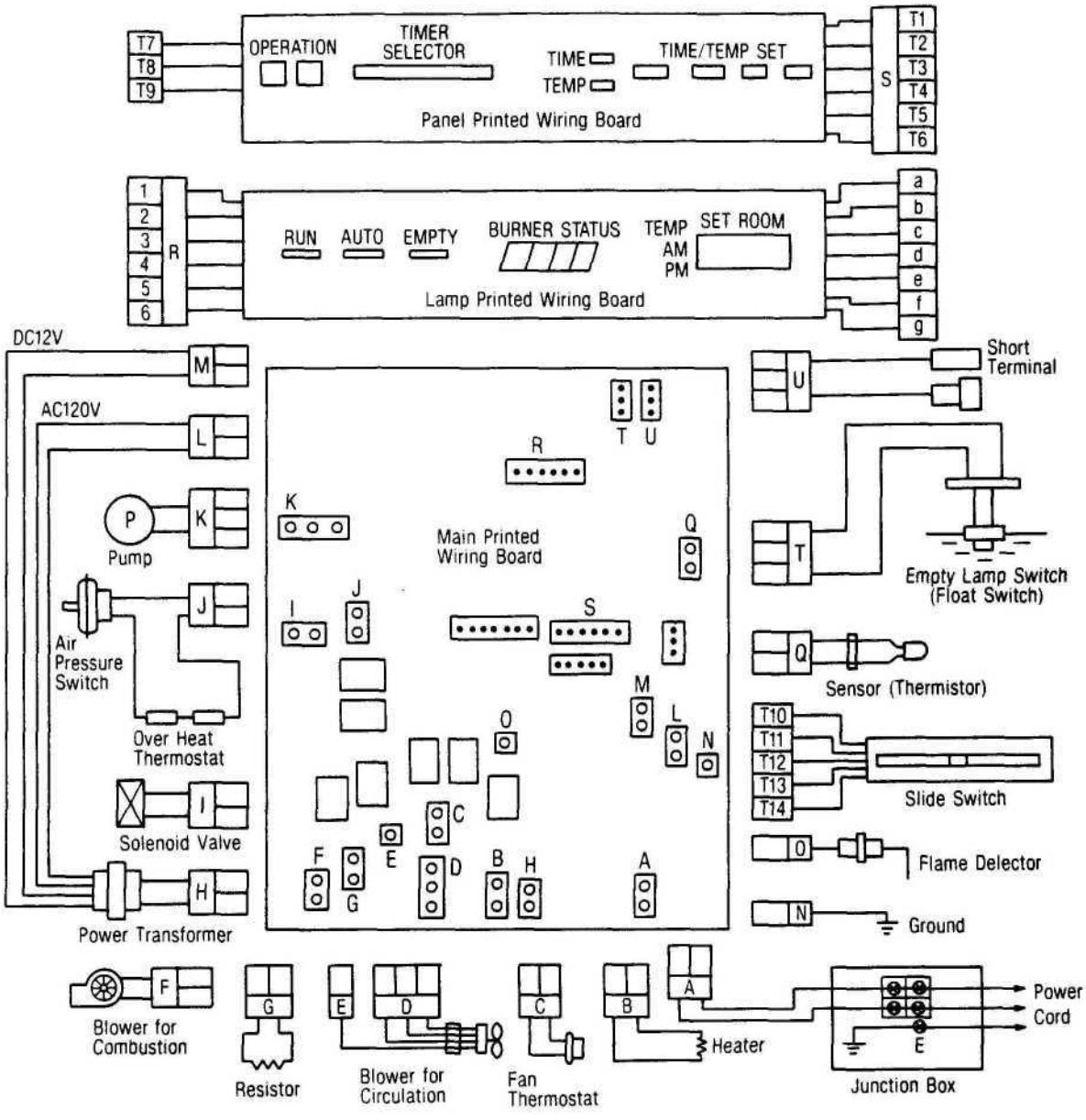
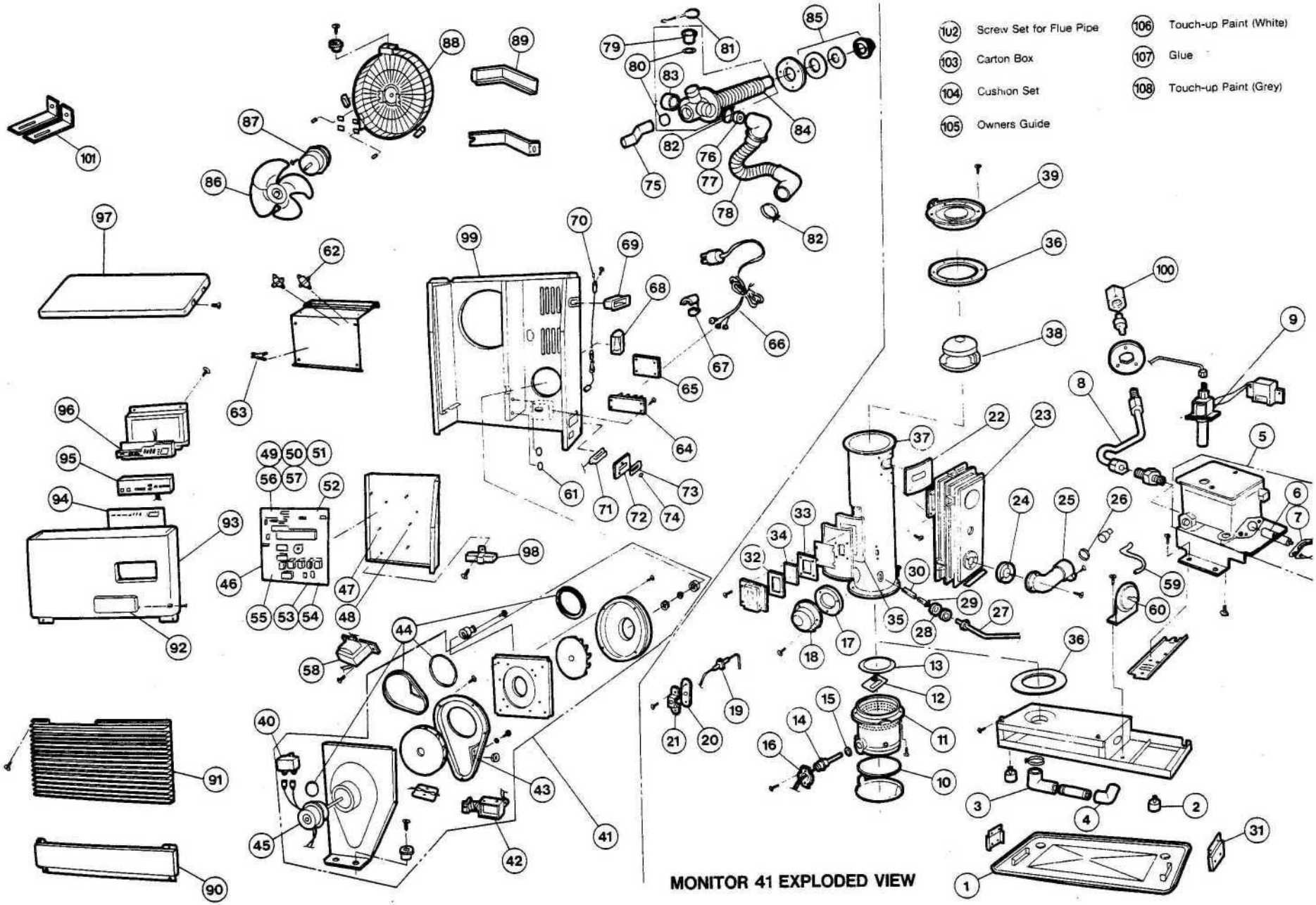


figure 7-2 Monitor 22

MONITOR 41 SERVICE PARTS LIST

ITEM NO.	PART NO.	DESCRIPTION	ITEM NO.	PART NO.	DESCRIPTION
1	6400	SPILL TRAY	55	6340	CAPACITOR (1.8 μFD)
2	5019	LEG	56	6187	TR ARRAY (M54563P)IC3
3	6301	AIR SUPPLY HOSE (A)	57	6204	PHOTO COUPLER(IC9~11)
4	6302	AIR SUPPLY HOSE (B)	58	6132	POWER TRANSFOPMER
5	6303	CONSTANT LEVEL VALVE	59	6326	AIR LINE
6	6304	C.L.V.STRAINER	60	6343	AIR PRESSURE SW
7	6344	STRAINER GASKET	61	6136	RUBBER BUSH
8	6305	FUEL PIPE	62	6327	OVER HEAT THERMOSTAT
9	6306	SOLENOID PUMP	63	6152	FAN THERMOSTAT
10	6357	GASKET (1)	64	6137	CORD CONNECTOR
11	6401	BURNER	65	6032	JUNCTION BOX COVER
12	6363	BURNER CLOTH	66	6139	POWER SUPPLY CORD
13	6358	ROPE GASKET	67	4833	CORD BUSHING
14	6311	HEATER	68	6037	LEVEL GUIDE
15	6115	GASKET (3)	69	6138	CARRYING HANDLE
16	6402	IGNITER BRACKET	70	6186	SENSOR ASSY
17	6354	HEATER COVER PACKING	71	6205	SLIDE SWITCH ASSY
18	6403	IGNITER COVER	72	6206	SLIDE SWITCH COVER
19	6355	FLAME DETECTIVE PLUG	73	6207	SLIDE SWITCH PANEL
20	6119	PLUG PACKING	74	6208	SLIDE SWITCH KNOB
21	6196	FL PLUG BRACKET	75	4004	JOINT PIPE
22	6313	GASKET (4)	76	6407	AIR DAMPER (E)
23	6314	HEAT EXCHANGER ASSY	77	6408	AIR DAMPER (S)
24	6122	GASKET (6)	78	6145	AIR SUPPLY HOSE ASSY
25	6123	EXHAUST DUCT	79	4014	EXHAUST OUTLET CAP
26	6176	O-RING (P39)	80	4016	AIR PORT O RING
27	6315	OIL SUMP PIPE	81	4006	PIPE HOLDER
28	6164	JOINT SEAL PACKING	82	4008	HOSE BAND
29	6352	FUEL NOZZLE	83	4805	AIR OUTLET CAP
30	6353	FUEL NOZZLE COVER	84	6147	FLUE PIPE ASSY
31	6404	BASE TRAY RETAINER	85	6148	SLEEVE FLANGE SET
32	6124	WINDOW GASKET	86	6075	FAN
33	6125	WINDOW FRAME GASKET	87	6330	CIRCULATION MOTOR
34	6405	WINDOW GLASS	88	6331	BLOWER GUARD
35	6350	WINDOW BASE GASKET	89	6347	WIRING GUARD
36	6317	CHAMBER GASKET	90	6332	UNDER COVER
37	6349	COMBUSTION CHAMBER	91	6409	LOUVER
38	6356	COMBUSTION RING ASSY	92	6410	CONTROL COVER
39	6321	CHAMBER GAP	93	6411	FRONT COVER
40	6322	CONDENSER (2.5 μFD)	94	6412	LAMP PANEL
41	6323	BLOWER ASSY	95	6154	SWITCH ASSY
42	6406	DAMPER SOLENOID ASSY	96	6155	LAMP ASSY
43	6324	SUCTION CASE A ASSY	97	6337	TOP COVER
44	6144	SEAL PACKING	98	6338	RESISTOR
45	6348	MOTOR FOR COMBUSTION	99	6413	CABINET ASSY
46	6362	PWB ASSY	100	6345	UNION NUT
47	6134	PWB SPACER CLIP (A)	101	6194	WALL CLAMPS
48	6135	PWB SPACER CLIP (B)	102	6197	SCREW SET FOR FLUE PIPE
49	6202	MICROPROCESSOR	103	6414	CARTON BOX
50	6168	RELAY (A)	104	6342	CUSHION SET
51	6169	RELAY (B)	105	1148	OWNERS GUIDE
52	6203	BUZZER	106	8216	TOUCH-UP PAINT(WHITE)
53	6172	FUSE (250V 10A)	107	8217	GLUE
54	6173	FUSE (250V 2A)	108	8219	TOUCH-UP PAINT(GREY)

MONITOR HEATING SYSTEM
EXPLODED VIEWS AND PARTS LIST



MONITOR 41 EXPLODED VIEW

MONITOR 22 SERVICE PARTS LIST

ITEM NO.	PART NO.	DESCRIPTION	ITEM NO.	PART NO.	DESCRIPTION
1	6200	SPILL TRAY	59	6136	RUBBER BUSH
2	5019	LEG	60	6151	OVER HEAT THERMOSTAT
3	6101	AIR SUPPLY HOSE (A)	61	6152	FAN THERMOSTAT
4	6102	AIR SUPPLY HOSE (B)	62	6163	AIR PACKING SET
5	6103	FUEL PIPE	63	6139	POWER SUPPLY CORD
6	6104	FUSIBLE VALVE	64	4833	CORD BUSHING
7	6105	CONSTANT LEVEL VALVE	65	6037	LEVEL GUIDE
8	6106	C.L.V.STRAINER	66	6138	CARRYING HANDLE
9	6189	STRAINER GASKET	67	6186	SENSOR ASSY
10	6108	SOLENOID PUMP PACKING	68	6205	SLIDE SWITCH ASSY
11	6109	SOLENOID PUMP	69	6206	SLIDE SWITCH COVER
12	6110	OIL SUMP PIPE	70	6207	SLIDE SWITCH PANEL
13	6164	JOINT SEAL PACKING	71	6208	SLIDE SWITCH KNOB
14	6111	FUEL SUMP	72	6140	BLOWER ASSY
15	6112	GASKET (1)	73	6141	BLOWER MOUTH PACKING
16	6182	BURNER	74	6142	DAMPER SOLENOID ASSY
17	6113	BURNER CLOTH	75	6143	SUCTION CASE
18	6114	GASKET (2)	76	6144	SEAL PACKING
19	6115	GASKET (3)	77	6160	BLOWER GUARD
20	6116	HEATER	78	6161	CIRCULATION MOTOR
21	6195	IGNITER BRACKET	79	6180	FAN BLADE
22	6117	HEATER COVER PACKING	80	6192	WIRING GUARD
23	6191	IGNITER COVER	81	6193	WIRING HARNESS(FAN MOTOR)
24	6118	FLAME DETECTIVE PLUG	82	4004	JOINT PIPE
25	6119	PLUG PACKING	83	6209	AIR DAMPER (S)
26	6196	FL PLUG BRACKET	84	6145	AIR SUPPLY HOSE ASSY
27	6120	GASKET (4)	85	4014	EXHAUST OUTLET CAP
28	6121	HEAT EXCHANGER ASSY	86	4016	AIR PORT O RING
29	6122	GASKET (6)	87	4006	PIPE HOLDER
30	6123	EXHAUST DUCT	88	4008	HOSE BAND
31	6176	O-RING (P39)	89	4805	AIR OUTLET CAP
32	6124	WINDOW GASKET	90	6147	FLUE PIPE ASSY
33	6125	WINDOW FRAME GASKET	91	6148	SLEEVE FLANGE SET
34	6068	WINDOW PLATE	92	6149	UNDER COVER
35	6069	WINDOW GLASS	93	6210	LOUVER
36	6126	WINDOW BASE GASKET	94	6211	FRONT COVER
37	6127	COMBUSTION CHAMBER	95	6154	SWITCH ASSY
38	6181	COMBUSTION RING ASSY	96	6155	LAMP ASSY
39	6128	BURNER CAP	97	6156	TOP COVER
40	6129	BAFFLE ASSY	98	6212	LAMP PANEL
41	6130	CHAMBER GASKET	99	6158	FUEL TANK COVER
42	6131	CHAMBER CAP	100	6159	FUEL TANK ASSY
43	6132	POWER TRANSFORMER	101	6179	FUEL TANK CAP
44	6201	PWB ASSY	102	6165	FLOAT SWITCH
45	6134	PWB SPACER CLIP (A)	103	6178	FLOAT SWITCH PACKING
46	6135	PWB SPACER CLIP (B)	104	6177	OIL FILTER
47	6202	MICROPROCESSOR	105	6162	RESISTOR
48	6168	RELAY (A)	106	6213	CABINET ASSY
49	6169	RELAY (B)	107	6345	UNION NUT
50	6203	BUZZER	108	6194	WALL CLAMPS
51	6172	FUSE (250V 10A)	109	6214	BASE TRAY RETAINER
52	6173	FUSE (250V 2A)	110	6197	SCREW SET FOR FLUE PIPE
53	6170	CAPACITOR (1.5μFD)	111	6215	CARTON BOX
54	6187	TR ARRAY (M54563P)IC3	112	6175	CUSHION SET
55	6204	PHOTO COUPLER(IC9~11)	113	1148	OWNERS GUIDE
56	6137	CORD CONNERCTOR	114	8216	TOUCH-UP PAINT(WHITE)
57	6107	AIR LINE	115	8217	GLUE
58	6184	AIR PRESSURE SWITCH	116	8219	TOUCH-UP PAINT(GREY)

MONITOR HEATING SYSTEM
EXPLODED VIEWS AND PARTS LIST

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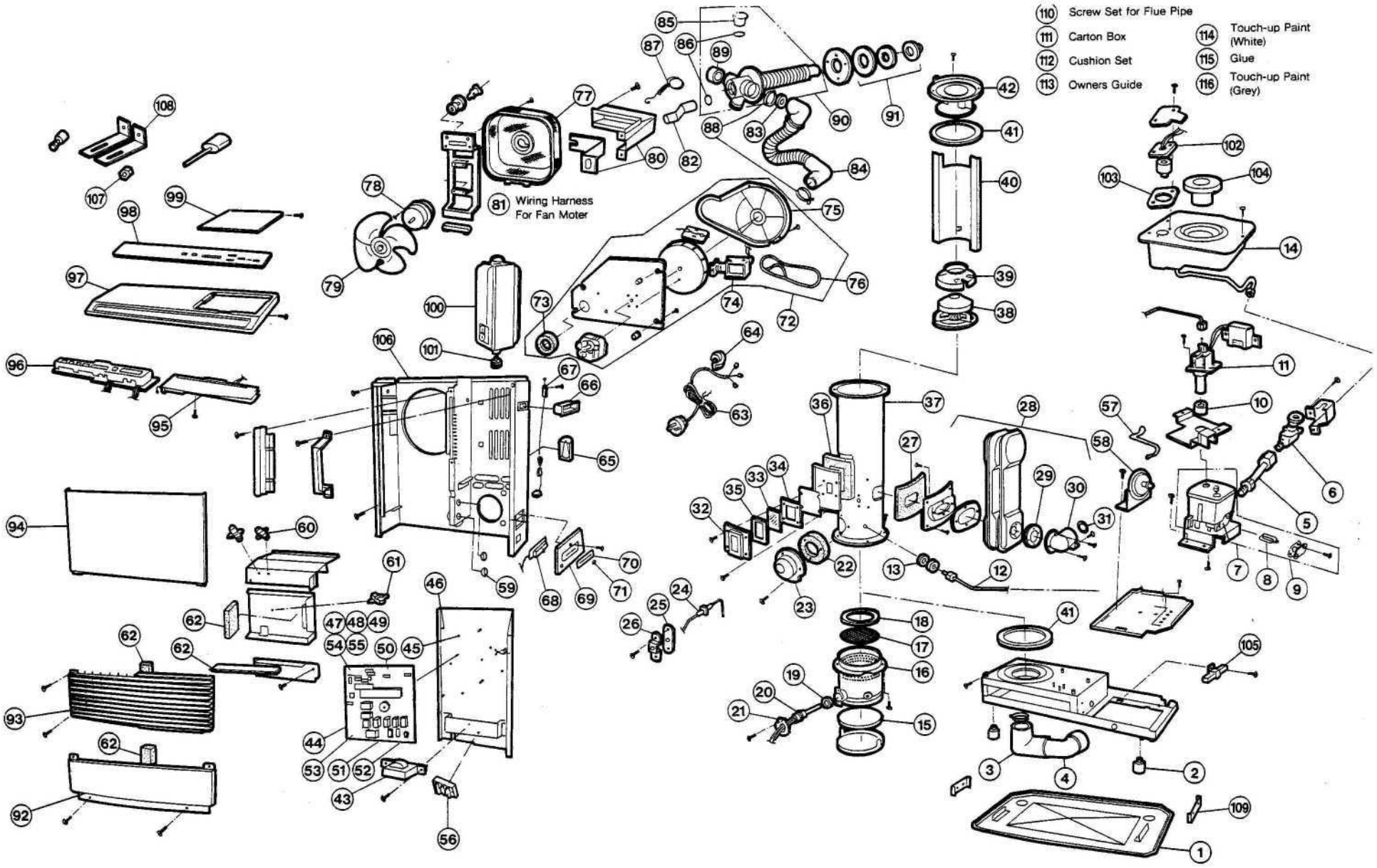

MONITOR 22 EXPLODED VIEW